

**Technical and Professional
Education**

**Curriculum Content Frameworks for
Cosmetology**

Curriculum Content Frameworks for
Cosmetology
Developed by the
University of Arkansas at Little Rock

State of Arkansas
Department of Workforce Education

Notice to the Reader

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Preface

The technical & professional program continues to prepare students for employment and continuing education. To accomplish this preparation, teachers and employers have collaborated to modify individual programs to ensure that instruction is current and comprehensive. This document reflects essential competencies for program completers as well as all aspects of the cosmetology industry as required by the Carl D. Perkins Act. The curriculum content frameworks for all technical & professional programs can be accessed through the Department of Workforce Education [Web site](#).

Foreword

The curriculum content framework for cosmetology supports courses that prepare students for the following career roles, which in turn correspond to the CIP (Classification of Instructional Programs) codes listed below. The courses may be sequenced with a variety of career and technical courses to form a specialization to prepare students for careers and support additional education and training in the beauty culture industry.

- Career Family: Retail/Wholesale Sales and Service
- Career Area: Personal Services
- Career Role CIP Code:
 - Cosmetology/Cosmetologist, General 120401
 - Hair Styling/Stylist and Hair Design 120407
 - Facial treatment Specialist/Facialist 120408
 - Aesthetician/Esthetician and Skin Care Specialist 120409
 - Nail Technician/Specialist and Manicurist 120410
 - Permanent Cosmetics/Makeup and Tattooing 120411
 - Salon/Beauty Salon Management/Manager 120412
 - Cosmetology, Barber/Styling, and Nail Instructor 120413

Acknowledgments

The Cosmetology Curriculum Content Framework was produced by a team of cosmetology instructors from the Little Rock School District and program developers from the University of Arkansas at Little Rock. The format and content of the framework reflect the specific training needs within the state of Arkansas as well as the competencies required to prepare for the National Cosmetology Licensure Exam. The framework format is modeled after a document originally developed by a writing team under the auspices of the Virginia Department of Education. Grateful appreciation is expressed to the Virginia Department of Education for granting the Arkansas State Department of Workforce Education access to its instructional frameworks.

University of Arkansas at Little Rock

Gretchen Watson
Laura Miller
Michael Gerfen

Cosmetology Instructors

Scottie Burchett
Linda Soderling

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Introduction

About the Program

Cosmetology prepares students for careers in the industry of beauty culture. The course sequence focuses on duties and tasks performed by professionals in cosmetology, as well as pre-employment and employability skills.

About the Document

- Section 1 contains a master duty/task list for the Cosmetology program.
- Section 2 contains an analysis of each task, consisting of the task, task definition, and process/skill questions to evaluate acceptable performance. All tasks have been designated essential. Essential tasks are those that must be achieved by every student pursuing the completion of the Cosmetology program.
- Section 3 lists the Arkansas Standards of Learning for language arts, mathematics, and science that are reinforced by instruction in the Cosmetology program. Academic skills in these areas are necessary for the mastery of a number of tasks performed by cosmetologists.

Course Descriptions

Cosmetology is the study of hair, skin, and nails and their related care. Students study and prepare in a clinical lab setting, using mannequins and live models for manipulative skill practice. The program emphasizes safety and sanitation, communication, and management skills. Related areas of study include psychology, ethics, and presentation of a professional image. Competency completions prepare the student for the National Cosmetology Licensure Exam.

Master Duty/Tasks Listing

Cosmetology I

Cosmetology II

National and state experts in the occupational field of cosmetology have validated the duties and tasks in this section. Each is analyzed by identifying the following:

- a *duty/task statement*, which describes what the student is to do.

DUTY A: Perform as a professional cosmetologist
Task:
A001: Identify a professional
A002: Define <i>cosmetology</i>
A003: Describe a cosmetologist
DUTY B: Demonstrate professional development
Task:
B001: Establish routines to maintain a healthy body and mind
B002: Practice effective communication
B003: Explain human relations
DUTY C: Explain the importance of salon ecology
Task:
C001: Recall the importance of microbiology to a cosmetologist
C002: Demonstrate infection control
C003: Identify first aid practices important to the cosmetologist

DUTY D: Explain the importance of anatomy and physiology in relation to cosmetology
Task:
D001: Explain the building blocks of the human body
D002: Describe the basic body systems
DUTY E: Review basic electricity in the salon
Task:
E001: Identify the principles of electricity
E002: Discuss electricity in cosmetology
DUTY F: Explain the principles of chemistry relating to hair, skin, nails, professional products, and cosmetics
Task:
F001: Identify matter, its properties, and changes
F002: Explain the pH scale
F003: Review the chemistry of cosmetics
DUTY G: Explain how knowledge of salon business will ensure financial rewards and personal and professional growth and development
Task:
G001: Explore the beauty industry
G002: Discuss job search
G003: Describe professional relationships

G004: Review salon ownership
G005: Discuss salon retailing
DUTY H: Discuss the importance of trichology
Task:
H001: Describe the importance of hair theory
H002: Explain the proper steps to hair care
H003: Demonstrate draping, shampooing, and scalp massage
DUTY I: Explain design decisions
Task:
I001: List the design decisions
I002: Conduct a client consultation
I003: Explain design composition
DUTY J: Describe haircutting
Task:
J001: Explain the theory of haircutting
J002: Explore haircutting procedures

DUTY K: Perform hairstyling
Task:
K001: Recall the theory of hairstyling
K002: Evaluate the techniques of thermal styling
K003: Demonstrate wet hairstyling
K004: Practice long-hair styling
DUTY L: Discuss wigs and hair additions
Task:
L001: Explain the use of wigs and hairpieces
L002: Demonstrate the use of hair additions
DUTY M: Explore chemical texturizing
Task:
M001: Demonstrate permanent waving
M002: Explore chemical relaxing
M003: Review curl reforming
DUTY N: Discuss hair coloring
Task:
N001: Explain color theory

N002: Identify existing hair color
N003: Demonstrate techniques in changing existing hair color
DUTY O: Explore the study of nails
Task:
O001: Discuss the theory of nails
O002: Explain and demonstrate natural nail care
O003: Perform artificial nail care
DUTY P: Recall the study of the skin
Task:
P001: Explain the theory of the skin
P002: Demonstrate skin care procedures
P003: Perform basic hair removal
P004: Demonstrate makeup application

Task Definitions

Cosmetology I

Cosmetology II

National and state experts in the occupational field of cosmetology have validated tasks in this section. Each task is analyzed by identifying the following:

- a *task definition* (criteria for acceptable performance), which explains what the student has to do to perform the task at the expected level of mastery, and
- *process/skill questions*, which assess student knowledge and performance.

Tasks are arranged by instructional duty area only. The placement of tasks into specific courses and the sequencing of tasks for instruction are local decisions based on student needs, employer demand, and school schedules.

DUTY A: Perform as a professional cosmetologist
Task:
<p>A001: Identify a professional</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • list those characteristics of professionalism common in a cosmetologist • review the importance of hard work, dedication, and commitment to the study of cosmetology <p>Process/Skill Questions</p>
<p>A002: Define <i>cosmetology</i></p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • list the elements of art and science in beauty care • state criteria for beautification of the hair, skin, and nails <p>Process/Skill Questions</p>
<p>A003: Describe a cosmetologist</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • review performing the art of beautification and care of hair, skin, and nails <p>Process/Skill Questions</p>

**DUTY B:
Demonstrate professional development**

Task:

B001: Establish routines to maintain a healthy body and mind

Definition: Process should include the following:

- list the recommended number of hours to sleep per night
- identify the effects of regular exercise
- recognize the value of a balanced meal
- explain the difference between personal and public hygiene
- describe the elements involved in presenting a professional image
- define the ergonomic posture steps to prevent injury while working

Process/Skill Questions

B002: Practice effective communication

Definition: Process should include the following:

- describe various nonverbal body language signs
- list the voice and grammar guidelines for verbal communications
- identify the keys to effective two-way communication

Process/Skill Questions

B003: Explain human relations

Definition: Process should include the following:

- understand the role personality, attitude, and habits play in human relations
- recognize consideration and cooperation as the foundation for teamwork
- explain the guidelines for professional ethics

Process/Skill Questions

**DUTY C:
Explain the importance of salon ecology**

Task:

C001: Recall the importance of microbiology to a cosmetologist

Definition: Process should include the following:

- define the types and classifications of bacteria and viruses
- explain the growth and reproduction patterns of bacteria and viruses
- describe the relationship of bacteria and viruses to the spread of infection

Process/Skill Questions

C002: Demonstrate infection control

Definition: Process should include the following:

- define and demonstrate sanitation precautions and procedures
- define and demonstrate disinfection precautions and procedures
- describe sterilization

Process/Skill Questions

C003: Identify first aid practices important to the cosmetologist

Definition: Process should include the following:

- define the first aid applications for minor burns
- define the first aid applications for cuts
- define the first aid applications for choking
- define the first aid applications for eye injury
- define the first aid applications for fainting procedures

Process/Skill Questions

**DUTY D:
Explain the importance of anatomy and physiology in relation to cosmetology**

Task:

D001: Explain the building blocks of the human body

Definition: Process should include the following:

- define the structure and function of cells
- define the structure and function of tissues
- recognize the function of the primary organs of the human body
- define the function of the body systems within the human body
- describe the function of the body systems within the human body

Process/Skill Questions

D002: Describe the basic body systems

Definition: Process should include the following:

- describe the structure and function of the skeletal system
- describe the structure and function of the muscular system
- describe the structure and function of the circulatory system
- describe the structure and function of the nervous system
- describe the structure and function of the digestive system
- describe the structure and function of the excretory system
- describe the structure and function of the respiratory system
- describe the structure and function of the endocrine system

Process/Skill Questions

**DUTY E:
Review basic electricity in the salon**

Task:

E001: Identify the principles of electricity

Definition: Process should include the following:

- define the 10 major terms used in electricity
- list the safety measures to be followed when using electrical appliances

Process/Skill Questions

E002: Discuss electricity in cosmetology

Definition: Process should include the following:

- explain the three kinds of effects that can be created by electric current during cosmetology services
- list three kinds of effects that can be created by electric current as it is used in electrotherapy and light therapy treatments

Process/Skill Questions

**DUTY F:
Explain the principles of chemistry relating to hair, skin, nails, professional products, and cosmetics**

Task:

F001: Identify matter, its properties, and changes

Definition: Process should include the following:

- define *matter*
- list the five elements of hair
- state the structures and behaviors of atoms and bonds

Process/Skill Questions

F002: Explain the pH scale

Definition: Process should include the following:

- describe the pH scale and values associated with water, acids, and alkalines

Process/Skill Questions

F003: Review the chemistry of cosmetics

Definition: Process should include the following:

- identify the precautions necessary for various classifications of chemicals when working with professional products and cosmetics

Process/Skill Questions

DUTY G:

Explain how knowledge of salon business will ensure financial rewards and personal and professional growth and development

Task:**G001: Explore the beauty industry**

Definition: Process should include the following:

- establish short- and long-range personal goals within the beauty industry

Process/Skill Questions

G002: Discuss job search

Definition: Process should include the following:

- list the steps necessary to search for a job
- explain the questions to be asked during a job interview
- describe personal qualities that will be evaluated during the interview
- identify potential job benefits that an employer might offer

Process/Skill Questions

G003: Describe professional relationships

Definition: Process should include the following:

- list the steps used to develop and maintain professional relationships
- build clientele by developing and maintaining professional relationships

Process/Skill Questions

G004: Review salon ownership

Definition: Process should include the following:

- describe salon ownership types, structure, operations, and requirements for the practice of good business

Process/Skill Questions

G005: Discuss salon retailing.

Definition: Process should include the following:

- define the techniques used to recommend retail products to clients
- list methods used to close the sale
- identify five buyer types
- describe follow-up techniques after a retail sale
- describe effective retail displays and inventory control procedures

Process/Skill Questions

**DUTY H:
Discuss the importance of trichology**

Task:

H001: Describe the importance of hair theory

Definition: Process should include the following:

- describe the formation of hair
- identify the growth and structure of hair
- define the behavior of hair
- explain how hair gains color

Process/Skill Questions

H002: Explain the proper steps to hair care

Definition: Process should include the following:

- identify the precautions necessary for various classifications of chemicals when working with professional products and cosmetics

Process/Skill Questions

H003: Demonstrate draping, shampooing, and scalp massage

Definition: Process should include the following:

- demonstrate all techniques of draping
- perform shampooing and conditioning techniques
- demonstrate a scalp massage

Process/Skill Questions

**DUTY I:
Explain design decisions**

Task:

I001: List the design decisions

Definition: Process should include the following:

- identify proportions used when creating a design for the human body and face

Process/Skill Questions

I002: Conduct a client consultation

Definition: Process should include the following:

- recognize and analyze key areas to create and support the client's total image by using proper communication skills during the client consultation

Process/Skill Questions

I003: Explain design composition

Definition: Process should include the following:

- discuss the design elements and principles used to compose designs

Process/Skill Questions

**DUTY J:
Describe haircutting**

Task:

J001: Explain the theory of haircutting

Definition: Process should include the following:

- identify the essential haircutting tools
- locate and explain the areas of the head
- describe fundamental cutting techniques

Process/Skill Questions

J002: Explore haircutting procedures

Definition: Process should include the following:

- demonstrate a solid form haircut
- demonstrate an increase-layered haircut
- demonstrate a graduated form haircut
- demonstrate a uniformly layered haircut
- demonstrate a combination form haircut
- demonstrate a square form haircut
- demonstrate a fade haircut

Process/Skill Questions

**DUTY K:
Perform hairstyling****Task:****K001: Recall the theory of hairstyling**

Definition: Process should include the following:

- list primary hairstyling considerations
- identify the fundamentals of hairstyling theory
- define hairstyling essentials
- describe infection control and safety as it pertains to hairstyling
- explain the client consultation as it pertains to hairstyling

Process/Skill Questions

K002: Evaluate the techniques of thermal styling

Definition: Process should include the following:

- demonstrate air forming solid form
- demonstrate scrunching layered form
- demonstrate air forming graduated form: round brush
- demonstrate air forming layered form: round brush
- demonstrate air forming combination form: 9-row brush
- demonstrate air forming combination form: round brush/curling iron
- demonstrate pressing and curling

Process/Skill Questions

K003: Demonstrate wet hairstyling

Definition: Process should include the following:

- sculpt finger waves and flat pin curls
- roll straight – volume rollers and pin curls
- set curvature – volume rollers and pin curls

Process/Skill Questions

K004: Practice long-hair styling

Definition: Process should include the following:

- create a three-strand over braid
- style a three-strand under braid
- demonstrate a French twist

Process/Skill Questions

**DUTY L:
Discuss wigs and hair additions**

Task:

L001: Explain the use of wigs and hairpieces

Definition: Process should include the following:

- list the history of wigs and hairpieces
- explain the composition, colors, and construction of wigs and hairpieces
- identify wig and hairpiece essentials
- describe infection control and safety procedures for wigs and hairpieces
- describe wig services
- identify hairpiece types

Process/Skill Questions

L002: Demonstrate the use of hair additions

Definition: Process should include the following:

- define *hair additions*
- describe five methods of hair addition attachment

Process/Skill Questions

**DUTY M:
Explore chemical texturizing**

Task:

M001: Demonstrate permanent waving

Definition: Process should include the following:

- wrap a rectangle perm
- perform a bricklay perm wrap
- demonstrate a spiral bricklay perm wrap
- create an oblong and spiral bricklay perm wrap

Process/Skill Questions

M002: Explore chemical relaxing

Definition: Process should include the following:

- apply a virgin thio relaxer
- demonstrate a relaxer retouch

Process/Skill Questions

M003: Review curl reforming

Definition: Process should include the following:

- demonstrate a curl reforming: contour wrap

Process/Skill Questions

**DUTY N:
Review hair coloring**

Task:

N001: Explain color theory

Definition: Process should include the following:

- define color
- describe the law of color

Process/Skill Questions

N002: Identify existing hair color

Definition: Process should include the following:

- define *melanin*
- describe gray hair
- identify natural level and tone
- identify artificial level, tone, and intensity
- review additional color considerations

Process/Skill Questions

N003: Demonstrate techniques in changing existing hair color

Definition: Process should include the following:

- explain semi-permanent color
- recall oxidative color: darker result
- demonstrate surface painting
- perform partial highlights: slicing
- create full highlights: weaving
- explain and demonstrate double-process blonde

Process/Skill Questions

**DUTY O:
Explore the study of nails**

Task:

O001: Discuss the theory of nails

Definition: Process should include the following:

- describe and recognize the structure of the nail
- explain the growth of the nail
- identify nail diseases, disorders, and conditions

Process/Skill Questions

O002: Explain and demonstrate natural nail care

Definition: Process should include the following:

- demonstrate a basic manicure
- perform a basic pedicure

Process/Skill Questions

O003: Perform artificial nail care

Definition: Process should include the following:

- demonstrate the application of nail tips
- apply tips with acrylic overlay
- create sculptured nails

Process/Skill Questions

**DUTY P:
Recall the study of the skin**

Task:

P001: Explain the theory of the skin

Definition: Process should include the following:

- list the functions of the skin
- describe the composition of the skin
- explain types of skin
- identify skin diseases and disorders

Process/Skill Questions

P002: Demonstrate skin care procedures

Definition: Process should include the following:

- demonstrate a basic facial

Process/Skill Questions

P003: Perform basic hair removal

Definition: Process should include the following:

- review basic hair removal techniques
- perform basic waxing techniques

Process/Skill Questions

P004: Demonstrate makeup application

Definition: Process should include the following:

- review basic makeup application

Process/Skill Questions

Related Arkansas Standards of Learning Introduction to Curriculum Frameworks

Purpose

This section of the framework contains material to help instructors in technical and professional programs reinforce basic skills in the areas of reading and writing, mathematics, and science. The technical portion of this guide takes a more direct approach by using specific duty and task listings, but changes in the academic section lead in a more general direction. The reason for this is simple: All good instructors do not teach in the same way. However, all good instructors share the trait of being able to connect their material to everyday life. For example, understanding concepts related to heat is important for cosmetology students as well as lathe operators in manufacturing plants. However, each program will probably take a different approach in the amount of detail and examples relating to heat concepts. Both groups require basic science knowledge of principles relating to heat, but the application of the principles will be different.

Basic Skills: The Content Areas

Included in this guide are materials to support basic skills in reading and writing, mathematics, and science. The overall approach taken here is a move toward problem-solving skills. By problem solving, we mean the ability to take information and use it for a purpose: to take action, make decisions, predict outcomes, suggest improvements. Another term for these thinking skills is a general “literacy.”

Literacy skills have always been in demand in the workplace. A quick review of workplace training programs and other literature regarding adult education demonstrates that the need for a literate workforce is still one of the most pressing problems employers face today. Indeed, many employers (from small- and medium-sized businesses to Fortune 500 companies) have spent hundreds of millions of dollars on in-house basic skills training programs.

What constitutes a literate workforce? There are many definitions for literacy and hundreds of tests that measure it, but when employers are asked what they’re looking for in potential new hires, the answers are general: They want individuals who can read and write, show up on time, think and solve problems, and keep their personal lives in order (that is, don’t bring a drinking problem into the workplace).

Viewed in this way, the words *literacy* and *literate* are good terms for what educators are trying to instill in their students, the future workforce. The more common definition (*being able to read and write*) is certainly appropriate, but the additional definitions (*knowledgeable, educated, well-informed*) are also apt. It is this broad term, *literate*, that we use to guide instructors on what to cover in the classroom. No matter which career-technical area is being focused on, no matter how technical the terminology is, instructors are given the task of helping students take information, break it down into

necessary parts, process details, and be able to come away with an understanding of some sort. This is *literacy*, and the process is the same for every subject area – teaching students how to think and solve problems.

Format

Each section includes a two-column table. Skills are listed on the left side; suggestions for implementing these skills into the curriculum are listed on the right side. Each suggestion is written in such a way that it can be tailored to most career-technical programs.

Using the Guide

This guide was prepared with the following four concepts in mind:

- The instructor is *aware of the need* for students to improve their basic skills.
- The instructor is the *best-qualified person* to decide how to include this material in the classroom or lab. The students' abilities and needs should drive the instructor in deciding how to use, expand, or modify these topics.
- The instructor *already has curriculum that works* for his or her students. Therefore, the suggestions for reinforcing basic skills
 - must be easy to implement,
 - must stand alone,
 - do not need to be taught in a particular order, and
 - must be open-ended enough to be useful for any career/technical program.
- ***Time is limited.*** Unless there are quick ways to reinforce basic skills, changes to the curriculum will not be made. Teaching basic skills in the context of technical material will help students make connections that are more memorable and will require no additional lesson planning. Just as instructors incorporate updates in technical knowledge, they can add basic skills concepts as well. Adding a few concepts at a time will help students perform better in the lab as well as on tests and evaluations.

Methods

The following methods may help instructors decide how to increase basic skill knowledge:

- *Collaborative projects* –a joint project between regular education teachers and CTE instructors could reinforce concepts for both programs.
- *Outside assignments* – students could benefit from an outside assignment explaining how a basic math (science, reading) concept ties to a process in the lab.

- *Extra credit* – students needing extra credit can research outside topics and turn in a short summary of material.
- *“Need-to-know” assignments* – students prepare a bulleted list of the basic concepts in science they need to know in order to correctly perform _____ operation in the lab.
- *Question of the day* – a few daily math problems for students to answer at the beginning of class allows the instructor to set the tone for the material. It also gives students an immediate goal when they enter the classroom and teaches them to stay on task. Bonus points may be awarded at the end of the week, quarter, semester, etc.
- *Two-minute oral presentations* – students who need to practice speaking skills can be asked to give a two-minute oral presentation at the end of class summarizing the main points for the day. Or a two-minute presentation at the beginning of class can recap the material from a previous class.
- *Connecting with workers* – students can poll parents, friends, area employers, or other individuals to find out the top five basic science skills needed on the job.
- *Direct questioning* – include a few basic knowledge questions in a presentation. Award points to groups based on correct answers

Resources

In creating the academic reinforcement material for the technical and professional frameworks, we used a number of source documents and resources.

- The English language arts, science, and mathematics components of the *Curriculum Improvement Project* by Dr. Willard Daggett were consulted to ensure that the top-ranked skills in those areas would be reflected in the academic support material. The English language arts and science components have many linkages to the material included here. (The higher-level math skills, such as trigonometry, were not included in this document.)
- Data was used from work with Arkansas employers. The Workplace Skills Enhancement Program (WSEP) at the University of Arkansas at Little Rock (UALR) has completed many training projects and job profiles for employers in Arkansas. Our constant contact with workers and employers provides a tremendous amount of data that we use in designing customized training programs and in working on projects such as curriculum frameworks. Also, the staff of WSEP has experience teaching in Arkansas public schools, the U.S. military, and the Job Corps.
- Additionally, other groups within UALR (the Labor Education Program, the Institute for Economic Advancement, and the College of Business) provide resources regarding health and safety information, labor unions and their role in the workplace, computer and information technology, and other training and outreach program data.

- The U.S. Department of Labor has many online documents and publications that support workers and issues regarding the workplace. (Work by Philippi and Greenan, 1988, on workplace skills was especially helpful.) Visit the Web site at www.dol.gov.
- The Occupational Safety and Health Administration provides online and other resources for instructors and professionals. For topics relating to safety and health, visit www.osha.gov.
- The Multistate Academic and Vocational Curriculum Consortium (MAVCC) develops competency-based curriculum. For more on MAVCC see www.mavcc.org.

Academic Standards for Reading and Writing

Strategies for Reinforcement in the Career-Technical Classroom

Note:

* indicates industry-related materials, handouts, notes, etc.

Objective	Classroom Applications to Industry
<p><i>Present, review and discuss, master the list of skills employers want for the workplace regarding reading and writing.</i></p>	<p>Use the list of skills employers want to introduce students to the requirements of the workplace.</p> <p>Depending on students' ability levels, any of the following methods may be used to increase their understanding of the concepts:</p> <ul style="list-style-type: none"> • discussion, • Interviewing parents or other adults in the workplace about the skills required, • interviewing employers about the skills in terms of importance, • identifying workplace situations in which certain skills become more important than others, • researching adult education programs to learn why deficits in these areas must be remediated and the cost spent yearly on these programs, or • researching the topic of adult literacy.
<p><i>Answer simple comprehension or recall questions from a lecture or from written material.</i></p>	<p>Provide two examples of workplace materials* on students' reading level.</p> <p>With the first, allow students to read information and then answer brief recall questions.</p> <p>With the second example, read aloud the material but do not give a handout; ask brief recall questions.</p> <p>Compare the differences. How do students retain information better – orally or</p>

	visually? Discuss learning styles and impact on the job.
<i>Follow, give oral instructions.</i>	Using instructions for a hands-on task, have students give oral instructions to a partner or group. Rate the effectiveness of the speaker.
<i>Follow, give written instructions.</i>	Using a short list of instructions for a hands-on task, have students give written instructions to a partner or group. Rate the effectiveness of the writer.
<i>Show the difference between relevant and irrelevant details.</i>	Using a copy of workplace materials*, have students underline relevant or important details in red, irrelevant or less important details in blue.
<i>Sort objects based on x number of criteria.</i>	Using workplace materials*, sort a group of objects based on characteristics identified by instructor (e.g., by color, shape, defect, or a combination of these).
<i>Recognize, identify technical vocabulary.</i>	Using workplace materials*, highlight technical vocabulary terms. Create a class dictionary of industry-related technical vocabulary. Students may add illustrations or diagrams. Each student receives a copy of the final product. Emphasize skills such as alphabetical order, guidewords, prefixes, suffixes, and pronunciation guides.
<i>Read aloud.</i>	Read aloud from workplace materials* in groups or individually.
<i>Identify, explain symbols, abbreviations, and acronyms relevant to subject area.</i>	Using workplace materials*, highlight symbols, abbreviations, and acronyms. Create a table with one column for each of symbols, abbreviations, and acronyms. Classify each one, and write in the meaning.

<i>Understand, use rules of grammar, usage, spelling, and punctuation.</i>	Identify the missing punctuation mark, misspelled word, or incorrect use of grammar from workplace materials*. Correct the mistakes.
<i>Discuss uses and purposes of a variety of workplace communication tools.</i>	Find examples of a business letter, memo, report, brochure, proposal, schematic, map, and diagram.
<i>Duplicate process demo by instructor.</i>	Using a workplace process, demonstrate steps to complete, and have students perform individually or in groups.
<i>Notice, apply word analysis techniques.</i>	Using workplace materials*, identify prefixes, suffixes, or roots that indicate meaning (e.g., <i>therma = heat</i>) ¹ .
<i>Match parts from photographs or diagrams to actual objects.</i>	Using workplace materials*, follow a sequence of pictures or diagrams to build, create, or copy an item or process.
<i>Read for main ideas and for details.</i>	Use a graphic organizer ¹ to show main ideas and supporting details.
<i>Distinguish between fact, opinion, and inference.</i>	Collect examples of materials based on fact or opinion/inference. Ask students to underline key terms that indicate the presence of facts or opinions.
<i>Distinguish between rows and columns; identify a cell as a block where a row and column intersect.</i>	Using charts or tables from workplace materials*, discuss the reasons for this format. Identify the quantity in a particular cell.
<i>Select, use appropriate resources and reference tools.</i>	Explain the uses for the following: dictionary, thesaurus, almanac, atlas, card catalog, encyclopedia. List reasons for choosing one reference tool over another. Use reference tools to answer questions related to industry or current events.

<p><i>Paraphrase written or oral material into summary form.</i></p>	<p>Using workplace materials*, determine the best way to condense or shorten the material so as to give an overview to a layperson.</p> <p>Using a set of guidelines appropriate to students' level in length and detail, summarize the information into bullet points.</p>
<p><i>Interpret, fill out/complete forms and records.</i></p>	<p>Using workplace materials*, answer basic questions (e.g., summarize the list of parts from an inventory).</p> <p>Using blank forms or documents, fill in details. Pay close attention to directions. Have students critique work with partner.</p> <p>Create a form or document to be used in a workplace process.</p>
<p><i>Use, develop a process for remembering details.</i></p>	<p>Use mnemonic devices to organize and remember details. Mnemonic devices¹ include Semantic Maps, Thought Webs, and other creative tools to organize thinking.</p>
<p><i>Proofread, correct mistakes in written drafts.</i></p>	<p>Using a newspaper article, locate and mark mistakes in grammar, punctuation, or usage.</p> <p>Correct mistakes in written drafts.</p>
<p><i>Examine different types of writing used in the workplace (reports, memos, brochures, logs, blueprints, formulas, etc.).</i></p>	<p>Gather samples of workplace materials*. Identify each by type.</p> <p>Compare and contrast the difference among audience (who the document is written for), length, background information/education needed to understand material, level of detail, organization, and layout of the document.</p>
<p><i>Understand the writing process.</i></p>	<p>In order to apply the writing process, create a workplace communication tool to be used for a specific purpose.</p>

	<p>Prewrite:</p> <ul style="list-style-type: none"> • Brainstorm, gather facts, or do research to create a business letter, memo, report, brochure, proposal, schematic, map, or diagram. • Identify the audience. • Determine the purpose of the document. <p>Write:</p> <ul style="list-style-type: none"> • Create a first draft. <p>Revise and edit:</p> <ul style="list-style-type: none"> • Make changes to ensure accuracy. • Look at the writing from a different point of view. • Shorten or make more concise where possible. • Use white space, bold print, and other formatting details to make the document easy to read. <p>Publish:</p> <ul style="list-style-type: none"> • Decide on the best format for the final copy (size, type of material, layout, graphics, etc.). • Publish the final draft.
<p><i>Identify, create</i> sentences of different types.</p>	<p>Using workplace materials*, find sentences of varying types. Examples include</p> <ul style="list-style-type: none"> • Simple sentences (subject + predicate) and • Complex sentences (subject + predicate including clauses). <p>Write sentences, paragraphs, or essays using sentences of different types (e.g., write a two-paragraph summary of today's lesson).</p>
<p><i>Identify, use</i> contractions correctly.</p>	<p>Using workplace materials*, locate contractions (e.g., <i>isn't, I'll</i>).</p> <p>Identify misuses of contractions.</p> <p>Write a short list of directions relating to an industry process, and use as many contractions as possible.</p>

<p><i>Identify, use correctly</i> commonly misspelled words.</p>	<p>Using a list of commonly misspelled words¹, locate errors in the media (newspaper articles, Internet sites, magazines).</p> <p>Ask each student to identify his/her problem words from the list.</p> <p>Attempt to incorporate problem words into class activities (e.g., add them to a list of work instructions).</p> <p>Give short weekly quizzes focusing on five words per week. Award bonus points.</p>
<p><i>Identify, use correctly</i> the English irregular verbs.</p>	<p>From a list of irregular verbs, review the uses of each.</p> <p>Ask each student to identify his/her problem irregular verbs from the list.</p> <p>Attempt to incorporate problem verbs into class activities, such as making a collection of mistakes from print.</p>
<p><i>Identify, use</i> signal words and other cues to improve writing.</p>	<p>Use a list of signal words¹, and discuss their purpose in writing (signal words are words that raise a flag to a reader to pay attention). Examples:</p> <ul style="list-style-type: none"> • Signal words showing emphasis – <i>most of all, It should be noted, Of course</i> • Signal words showing a conclusion – <i>Lastly, In summary, Finally</i> <p>Identify common signal words in workplace writing, especially in sequenced lists.</p> <p>Write a list of work instructions, using signal words.</p>
<p><i>Identify</i> components of workplace documents, such as blueprints, schematics, floor plans, and other industry-related documents.</p>	<p>Label the parts of a workplace document.</p>

<i>Place steps in proper sequence.</i>	Using a list of steps or pictures, cut them apart so students can place them in the proper order.
<i>Analyze cause and effect.</i>	Experiment with cause and effect in the classroom (e.g., change the sequence of events in a process).
<i>Determine missing information.</i>	<p>Locate the information that is missing from a problem, and explain why the problem cannot be solved without it.</p> <p>To reinforce concepts, use a completed problem, and remove the important details. Ask students if they can identify what's missing.</p>
<i>Differentiate between tools used for a job.</i>	Given a list of tools and a list of functions, identify the most efficient tool for each task.
<i>Assemble or disassemble objects.</i>	<p>From a list of oral or written instructions, assemble an object or complete a process.</p> <p>Have students write the instructions for disassembly.</p>
<i>Cross-reference materials to compare information.</i>	Using more than one source document, compare the information given.
<i>Interpret reasoning behind rules or regulations.</i>	Using workplace materials*, make a list of possible reasons or justifications for a safety guideline, regulation, etc.
<i>Show contrasts between approaches.</i>	<p>Given a workplace scenario, write a brief approach to solving the problem. (Working in groups would be beneficial.)</p> <p>Compare and contrast each approach from the perspective of a worker, manager, and supervisor.</p>
<i>Organize data in a new format.</i>	Using workplace materials*, organize the information in a new format.

<i>Prove a rule or method's sufficiency.</i>	Perform an experiment to determine how much tolerance is acceptable in a case study (e.g., find the range of drops of red dye sufficient to match the standard red color used in latex paint).
<i>Show relationships between two or more systems.</i>	Using two or more partners related to industry, show or explain how they are interrelated (e.g., explain the relationship between social workers and hospitals).
<i>Given examples of emergency situations, identify real-world courses of action.</i>	Using an emergency situation common to your industry, outline a step-by-step plan for action.
<i>Identify variables that affect the outcome of a process.</i>	Experiment with or predict variables that affect the outcomes for a process (e.g., weather patterns that adversely affect a process, such as building a road).
<i>Infer situations that meet guidelines when complete information is not available.</i>	Given a policy or industry standard that has debatable interpretations, list possible situations that can arise that do not have clear solutions in the policy. Discuss or debate the issues.
<i>Compare finished products to a set of guidelines.</i>	Compare a set of objects to a set of guidelines (e.g., analyze a batch of parts, and document how they do or do not meet a set of quality assurance guidelines). List any discrepancies (parts that do not meet guidelines), and categorize them by type (e.g., burns, holes, etc.).
<i>Identify preventative measures for maintenance of a system.</i>	List the needed routine maintenance to keep a system working properly.
<i>Predict new standards or rules that may become necessary in the future.</i>	Identify recent areas of change or development in your industry. Discuss potential future needs or developments that may occur (e.g., potential need for better training requirements for airport personnel).

<p><i>Improve a process by streamlining (locating waste) or decreasing lost time.</i></p>	<p>Examine a process in industry in step-by-step detail. Suggest ways to decrease time needed or make the process more efficient.</p> <p>Isolate the cause of failure in a process by performing an experiment.</p>
<p><i>Prepare a model explaining a concept.</i></p>	<p>Build, draw, or create a model that explains a concept (e.g., show a need for environmental standards for water or air pollution),</p>

¹ Fry, Edward, Kress, Jacqueline, and Fountoukidis, Dona. *Reading Teacher's Book of Lists*, 4th ed. ISBN 0-13-028185-9

Academic Standards for Mathematics

Strategies for Reinforcement in the Career-Technical Classroom

Note:

* indicates industry-related materials, handouts, notes, etc.

Topics Listing

- Problem Solving
- Operations and Calculations
- Applications
- Data Analysis and Display

Objectives

Classroom Applications to Industry

<p><i>Present, review and discuss, master the list of skills employers want for the workplace regarding mathematics.</i></p>	<p>Use the list of skills employers want to introduce students to the requirements of the workplace.</p> <p>Depending on students' ability levels, any of the following methods may be used to increase their understanding of the concepts:</p> <ul style="list-style-type: none"> • discussion, • Interviewing parents or other adults in the workplace about the skills required, • interviewing employers about the skills in terms of importance, • identifying workplace situations in which certain skills become more important than others, • researching adult education programs to learn why deficits in these areas must be remediated and the cost spent yearly on these programs, or • researching the topic of adult literacy.
PROBLEM SOLVING	
<p><i>Examine, apply problem-solving process.</i></p>	<p>Define the problem.</p> <ul style="list-style-type: none"> • What is being asked? • Decide on a type of solution. • Is it a multistep or single-step question?

	<p>Try any of the following:</p> <ul style="list-style-type: none"> • Estimate an answer. • Draw a diagram. • Find a pattern. • Guess and check. • Logical reasoning. • Make a graph. • Make an organized list. • Make a table. • Solve a simpler problem. • Use a simulation. • Work backwards. • Write an equation. <p>Locate information you need.</p> <ul style="list-style-type: none"> • Do you have all the components? • Get missing information. (You may need to perform some other calculations.) <p>Calculate.</p> <ul style="list-style-type: none"> • Look at the answer. How should the remainder be expressed? <p>Check the solution.</p> <ul style="list-style-type: none"> • Is it reasonable
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OPERATIONS and CALCULATIONS

<i>Read, write, and count numbers.</i>	<p>Read and write numbers (especially focus on very large and very small numbers where mistakes are common).</p> <p>Give a weekly quiz asking students to compare and sequence numbers. Example: 0.4445 ___ 0.4455 > or <</p> <p>Put the following in order from smallest to largest: 0.66, 0.677, 0.67</p>
<i>Round numbers.</i>	<p>Discuss your industry's use of decimals.</p> <p>Identify the place values needed to adequately perform a job (e.g., a quality</p>

	<p>assurance technician working on the line in a manufacturing plant may need to use numbers through the ten-thousandths decimal place).</p> <p>Take a series of sample measurements, and round them to the nearest decimal place identified by the instructor.</p>
<p><i>Estimate numbers,</i></p>	<p>The skill of making close estimations is tied to understanding accuracy. Discuss real-life situations in which estimation is used.</p> <p>Discuss the practice of estimation before calculation. Regular practice in estimating before calculating will teach students where they make errors and increase their estimation skills.</p> <p>Discuss work situations in which estimation skills are required and possible consequences of making errors. (For example, is an estimate appropriate for inventory purposes? Ordering supplies?)</p>
<p><i>Compute averages.</i></p>	<p>Discuss averages in general terms. Calculate the average temperature, average precipitation, average number of students per class, and other examples.</p> <p>Using workplace materials*, calculate a series of averages. For example:</p> <ol style="list-style-type: none"> 1. Take 10 measurements of a piece of pipe, using a micrometer. 2. Compare the measurements. 3. Find the average of all the measurements. 4. Compare the average to the smallest and largest measurement. 5. Discuss the effects on quality. When is an average an acceptable benchmark measurement?

<p><i>Calculate with whole numbers; perform one-step problems with basic operations.</i></p>	<p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of addition, subtraction, multiplication, and division.</p>
<p><i>Perform problems that require an understanding of the order of operations.</i></p>	<p>Using workplace materials*, make a list of situations or problems that need more than one step to perform them.</p> <p>If the procedures (add, subtract, multiply, divide) are on the same level of importance, such as adding or subtracting, then the order of operations will not impact the way the problem is solved.</p> <p>If a problem requires more than one level of operation to solve (example, dividing and adding), work the problem correctly by performing the division part first and then the addition.</p> <p>Rework the problem using addition first. Compare the answers.</p> <p>Discuss the importance of reasoning skills to verify that an answer makes sense.</p>
<p><i>Understand the relationship between decimals, fractions, and percentages.</i></p>	<p>Make a table comparing fractions, decimals, and percentages.</p>
<p><i>Compute with fractions, decimals, and percentages, and show understanding of the relationship among them.</i></p>	<p>Create sample problems using fractions that relate to everyday situations. For example:</p> <p style="padding-left: 40px;">Poll the class on interesting topics (favorite food). Convert whole numbers to fractions. Votes –</p> <p style="padding-left: 40px;">Pizza 10 Salad 2 BBQ 8</p> <p style="padding-left: 40px;">$10+2+8 = 20$ (Recognize denominator value.)</p>

	<p>$\frac{10}{20}$ Pizza $\frac{2}{20}$ Salad $\frac{8}{20}$ BBQ</p> <ul style="list-style-type: none"> • Add the fractions. $\frac{10}{20} + \frac{2}{20} + \frac{8}{20} = \frac{20}{20}$ <p>Convert fraction to a whole number. (Total answer equals one class's worth of answers.)</p> $\frac{10}{20} + \frac{2}{20} + \frac{8}{20} = \frac{20}{20} = 1$ <p>Convert fractions to percentages. $\frac{10}{20}$ means 10 divided by 20 = 0.50</p> <p>Move decimal 2 places right 0.50 = 50%</p> <p>$\frac{2}{20}$ means 2 divided by 20 = 0.10 0.10 = 10%</p> <p>$\frac{8}{20}$ means 8 divided by 20 = 0.40 0.40 = 40%</p> <p>50% + 10% + 40% = 100% Notice the totals add to 100%.</p> <p>So, $\frac{20}{20} = 1 = 100\%$</p> <p>Using workplace materials*, calculate work-related questions, using fractions, decimals, and percentages.</p> <p>Calculate shipping costs for Internet purchases (such as music from amazon.com).</p>
<p>Solve formulas and equations.</p>	<p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of equations.</p>

	<p>Work left to right. Use order of operations. Place numbers on one side, variables on the other side.</p>
<p>Obtain squares and square roots.</p>	<p>Review the methods for calculating squares, square roots, cubes, and cube roots. Use industry-related formulas to demonstrate examples.</p> <p>Compare the difference between the two common answers to 3^2 (answer = 9, not 6).</p> <p>How would an incorrect value affect the work on the job?</p>
<p>Convert units of measure: Recognize components of measuring systems (U.S. and metric) for length.</p>	<p>Discuss industry measures and terms relating to length.</p>
<p>Convert units of measure: Recognize components of measuring systems (U.S. and metric) for mass/weight.</p>	<p>Discuss industry measures and terms relating to mass/weight.</p>
<p>Convert units of measure: Recognize components of measuring systems (U.S. and metric) for volume.</p>	<p>Discuss industry measures and terms relating to volume.</p>
<p>Measure with a certain degree of accuracy.</p>	<p>Estimate measurements.</p> <p>Using workplace materials* and tools, take measurements of work-related and classroom items.</p> <p>Depending on ability level, students may measure to the nearest foot, inch, centimeter, etc.</p>
APPLICATIONS	
<p>Solve word problems.</p>	<p>Help students feel more comfortable with word problems by placing simpler problems in word problem form. Or take concepts students have already mastered, and ask them to write word problems for each other to solve.</p>

<i>Select/apply mathematical formula.</i>	Review a set of math formulas and then a list of sample problems. Decide which formula(s) apply to each problem.
<i>Understand the importance of time in the workplace.</i>	Using workplace materials*, make a list of workplace scenarios that require using time correctly, such as keeping a time card or heating a liquid solution for 20 minutes.
<i>Recognize components of time systems (clocks and calendars).</i>	a.m. and p.m. leap year military time
<i>Discuss, identify, understand terms relating to measuring time.</i>	Discuss the units of time measurement and time vocabulary – second, minute, hour, day, week, month, year, leap year, fiscal year, quarter, annual, biannual, etc.
<i>Understand that time can be expressed in terms of equivalencies.</i>	Show the time equivalencies using fractions. For example: $1\frac{1}{2}$ days = ___ hours $1 \text{ day} = 24 \text{ hours}$ $+ \frac{1}{2} \text{ day} = +12 \text{ hours}$ $1\frac{1}{2} \text{ days} = 36 \text{ hours}$
<i>Compute time conversions.</i>	Make a table that shows the equivalencies of time units. Compute conversion problems at the appropriate level of difficulty. Examples include <ul style="list-style-type: none"> • convert minutes to hours, • convert hours to days, and • convert seconds to years.
<i>Calculate ratios and proportions.</i>	Review fractions when discussing ratios and proportions. Draw common classroom items to scale by finding a conversion rate (1 foot equals 1 inch). Make predictions using ratios. (If each student in the class has three children,

	<p>how many children will there be all together? Write the ratios.)</p>
<p>Apply geometry principles: Use formulas for measuring shapes of 2 dimensions.</p>	<p>Determine the formulas that apply to 2 dimensions – perimeter, area, surface area, etc.</p> <p>Find the perimeter of the classroom.</p> <p>Discuss the perimeter of objects that are not shaped as perfect squares. How does this change the formula for perimeter?</p> <p>Find the area of the tiles on the floor.</p> <p>Find the area of the classroom.</p> <p>Review that all areas are expressed in terms of square units (square inches, square miles, etc.).</p>
<p>Apply geometry principles: Use formulas for measuring shapes of 3 dimensions.</p>	<p>Review the formulas that apply to 3 dimensions of objects – volume.</p> <p>Find the volume of common objects such as soda cans, pizza boxes, etc.</p> <p>Review that volume is expressed in cubic units.</p> <p>Discuss industry-specific needs for these formulas. (For example, find the volume of a tank or silo.)</p>
<p>Define terms relating to money.</p>	<p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles relating to money.</p> <p>For more advanced students, include terms and principles of economics, finance, or statistics.</p>

<i>Perform one-step problems involving money.</i>	Make change. Count up (rather than backwards) to make change.
<i>Perform multiple-step problems using money</i>	Calculate gross and net earnings. Calculate <ul style="list-style-type: none"> • interest, • sales tax, • percent off, • sale price, and • profit percentages. Perform banking transactions.
<i>Perform business-related financial activities.</i>	At a level of complexity appropriate to your industry and to students' ability levels, solve income/expense problems, prepare budgets, etc.
<i>Use a calculator to perform computations.</i>	Identify appropriate activities that can be performed using a calculator (calculators allow students to concentrate on problem-solving strategies). Award prizes for weekly activities or competitions.
<i>Calculate measurements taken from measuring devices.</i>	Add, subtract, multiply, and divide measurement numbers by plugging them into formulas.
<i>Perform/prepare an inventory.</i>	Use a sample group of items to prepare an inventory. Review inventory vocabulary terms. Discuss the math processes that would apply to the inventory process.
DATA ANALYSIS AND DISPLAY	
<i>Recognize types of visual representations.</i>	<ul style="list-style-type: none"> • Charts • Graphs • Tables

<p><i>Interpret charts, graphs, and tables.</i></p>	<p>Answer simple questions about charts, graphs, and tables.</p> <p>Solve multistep problems involving the correlation of graphs and tables.</p>
<p><i>Collect/record data.</i></p>	<p>As appropriate to industry, practice sampling methods. Discuss safety precautions for sampling. Visit OSHA at the Department of Labor Web site for more details.</p> <p>Practice collecting and recording sample data from your industry (such as measurements taken using a micrometer). Compare class answers.</p> <p>Find the range of answers (maximum and minimum). Find the average.</p> <p>Discuss an acceptable range of answers (\pm), and graph the results showing the number that fell inside and outside the acceptable range.</p>
<p><i>Review and apply principles of probability.</i></p>	<p>Use real-life examples that are highly motivating to direct the students' attention to probability principles. (Example, "I am thinking of a number between 1 and 50. The person who guesses the number will receive that many bonus points if s/he can tell me the probability of choosing the number correctly.")</p>
<p><i>Use probability models to predict chance events.</i></p>	<p>Calculate the <u>theoretical probability</u> of an event (e.g., the probability of rolling a 5 on a die is $1/6$).</p> <p>Find the <u>empirical probability</u> of an event by performing repeated experiments.</p> <p>Compare the two probabilities.</p>
<p><i>Calculate and interpret statistics.</i></p>	<p>Identify the importance of using statistics correctly.</p>

	<p>Bring examples of statistics from the news or media and analyze them. Are they ambiguous? Are they correct? What data is the advertisement trying to get the public to see? (For a humorous look at statistics, see <i>How to Lie with Statistics</i> by Huff and Geis.)</p>
<p>Interpret plans/blueprints.</p>	<p>Review vocabulary and terms for plans, blueprints, and schematics.</p> <p>Build a plan or blueprint one layer at a time, starting with the basic identifying information.</p> <p>Add layers of wax paper or other transparent drawing material on top of the first layer, so each layer can be viewed individually or the entire drawing can be viewed as a whole.</p>
<p>Construct charts and tables.</p>	<p>Discuss chart types and chart vocabulary.</p> <p>Using workplace or sample data from the class, construct tables and charts.</p> <p>For a daily example, consult <i>USA Today</i> online, and look for the snapshots section that shows a graph of some sort. Ask weekly bonus questions about the data.</p> <p>Challenge students to bring in examples of charts and graphs containing errors.</p>

Academic Standards for Science

Strategies for Reinforcement in the Career-Technical Classroom

Note:

* indicates industry-related materials, handouts, notes, etc.

Topics Listing

General Science topics not specific to a content area

Physical Science
Mechanics and Physics
Energy and Waves
Thermodynamics
Electromagnetism
Chemistry
Optics

Life Science
Cell Biology
Evolution
Genetics and Heredity
Human and Animal Development

Anatomy
Ecology
Viruses
Bacteria
Plants

Objective	Classroom Applications to Industry
GENERAL SCIENCE	
<p><i>Present, review and discuss, master the list of skills employers want for the workplace regarding science skills.</i></p>	<p>Use the list of skills employers want to introduce students to the requirements of the workplace.</p> <p>Depending on students' ability levels, any of the following methods may be used to increase their understanding of the concepts:</p> <ul style="list-style-type: none"> • discussion, • Interviewing parents or other adults in the workplace about the skills required, • interviewing employers about the skills in terms of importance, • identifying workplace situations in which certain skills become more important than others, • researching adult education programs to learn why deficits in these areas must be remediated and the cost spent yearly on these programs, or • researching the topic of adult literacy.
<p><i>Perform computations as required to solve problems.</i></p>	<p>Use the metric system to convert units of measure.</p> <p>Round numbers to the correct number of significant figures.</p> <p>Determine percentage of error.</p> <p>Understand validity, reliability, accuracy, and precision.</p>
<p><i>Apply scientific method of inquiry.</i></p>	<p>Identify the steps of the scientific method.</p> <p>Conduct experiments.</p> <p>Understand the following terminology:</p> <ul style="list-style-type: none"> • conclusions vs. inferences, • variables, • replications, and • samples/sample size.

<p>Investigate science history as it applies to industry.</p>	<p>In groups, research topics in science pertaining to your industry. Have students assign roles for each member of the group.</p> <p>Present findings in report format or in oral presentations.</p> <p>Investigate science ethics.</p> <p>Recognize the processes available for accountability in industry. For example, OSHA has a Safety and Health Program Assessment Worksheet whereby employers can be rated for safety issues. See http://www.osha.gov/SLTC/etools/safetyhealth/form33ii.html.</p> <p>[Note: Safety and health is a mandatory subject of bargaining when a workplace is unionized; in both unionized and non-unionized workplaces, an employer cannot create and dominate workplace safety committees (see the National Labor Relations Act).]</p>
<p>Identify Systeme International- (SI) derived units.</p>	<p>Choose units appropriate to your industry (hertz, ohm, volt, watt, etc.).</p> <p>Create a picture dictionary demonstrating the concepts.</p>
<p>Review relevant theories, laws, and models.</p>	<p>As related to your industry, discuss important theories, laws, and models.</p>
<p>Use reference tools to solve problems.</p>	<p>Use scientific reference tools (such as the Periodic Table of Elements) to learn more about specific industry concepts.</p>
<p>Practice safe lab procedures.</p>	<p>Handle equipment with care.</p> <p>Demonstrate safety and first aid procedures.</p> <p>Identify harmful substances.</p>

PHYSICAL SCIENCE	
<i>Explain the concepts of work and power.</i>	<p>Identify machines used in industry.</p> <p>Identify how energy levels change when work or power is increased/decreased.</p> <p>Identify fuel sources used in your industry.</p> <p>Discuss internal and external combustion.</p> <p>Create a model demonstrating the uses of levers and pulleys.</p>
<i>Understand concepts related to force.</i>	<p>Show the need for balance of forces acting on an object.</p> <p>Observe centrifugal and centripetal forces in action.</p> <p>Show how friction is created and must be accounted for in using and preserving equipment.</p> <p>Create a chart showing types of lubricants needed in a factory and schedule of maintenance.</p> <p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of inertia.</p> <p>Show the relationship between pressure, mass, and weight.</p>
<i>Understand and apply principles relating to the atom.</i>	<p>Understand that atoms have a positive, negative, or neutral charge. Classify protons, electrons, and neutrons.</p> <p>Identify ions.</p>
<i>Discuss, apply principles of electricity and electric currents.</i>	<p>Identify types of circuits and switches.</p> <p>Show the difference between direct and alternating currents. Give examples of the best/most efficient use of each.</p>

	<p>Determine how electricity is measured, and solve problems using these terms. (Example, use Ohm's law to calculate current, resistance, and voltage.)</p> <p>Identify good conductors and insulators and how to choose them.</p> <p>Understand grounding, and create a visual display of grounding safety practices. Include the threat of static electricity.</p> <p>Show the uses of a vacuum tube by building a model.</p> <p>Compare the following ways of generating electricity:</p> <ul style="list-style-type: none"> • hydroelectricity, • motors, • solar power, • steam/nuclear, • transformers, and • incandescent (light). <p>Show the implications for your industry.</p> <p>As appropriate to your industry, identify electrochemical energy sources (cells, electrodes, batteries) and the processes of oxidation and reduction.</p>
<p><i>Be familiar with principles of heat.</i></p>	<p>Differentiate between the three types of heat transfer (conduction, convection, radiation).</p> <p>Understand that substances expand and contract due to heating and cooling.</p> <p>Identify purpose and types of insulations used.</p> <p>Differentiate between <i>heat</i> and <i>temperature</i>.</p>
<p><i>Investigate and apply concepts relating to temperature.</i></p>	<p>Use the temperature scales; convert between Celsius and Fahrenheit.</p>
<p><i>Explain the concepts of magnetism.</i></p>	<p>Understand that currents create magnetic fields.</p>

	<p>Identify materials that are good conductors and the properties that make them such.</p> <p>Understand electromagnetic forces present in Earth.</p>
<i>Investigate/apply chemical properties.</i>	<p>Differentiate between <i>acids</i> and <i>bases</i>. Find pH for substances used in industry.</p> <p>Identify substances used in your industry, and classify them by type.</p> <p>Name the major drugs, fertilizers, or additives used in your industry.</p> <p>Define and state examples of chemical reactions.</p> <p>Be familiar with solutions used in your industry.</p> <p>Compare saturated and unsaturated solutions.</p> <p>Determine whether a solution is soluble or insoluble.</p> <p>Explain <i>solute</i> and <i>solvent</i>.</p>
<i>Investigate forms of and changes in matter.</i>	<p>Compare and contrast physical and chemical changes.</p> <p>Discuss the types of physical or chemical changes that take place in your industry, from processing raw materials to manufacturing.</p>
<i>Be familiar with principles of light.</i>	<p>Discuss light as a form of energy.</p> <p>Describe types of lighting systems.</p> <p>Examine the light spectrum, and note the relative smallness of visible light.</p> <p>Define <i>reflection</i> and <i>refraction</i>.</p>

	<p>Explain how light carries information (by lasers), and show examples of the impact on technology/industry.</p> <p>Identify types of lenses.</p>
<i>Be familiar with principles of color.</i>	<p>Diagram the main parts of the eye involved in seeing color (rods, cones).</p> <p>Use prisms to split light into the visible spectrum.</p> <p>Briefly explore color blindness. What precautions should colorblind individuals take regarding workplace safety? Define situations in which colorblindness impacts a worker's ability to do his/her job.</p>
LIFE SCIENCE	
<i>Compare/contrast the differences between sexual and asexual reproduction.</i>	<p>Determine instances when understanding the concepts of sexual reproduction are important for your industry.</p> <p>Highlight the effects of unsafe working practices on unborn fetuses or the dangers present for pregnant women working in industry.</p>
<i>Show a general understanding of the importance of health.</i>	<p>Explore the cost of lost wages and worker's compensation in the past year due to health problems.</p> <p>Research the most common health problems among workers (workers with safe jobs, workers with most hazards to health, etc.).</p>
<i>Understand nutrition and the body's need for a diet that provides vitamins and minerals.</i>	<p>Show an understanding of body systems (circulatory, nervous, digestive, etc.) as they relate to industry.</p> <p>Identify deficient vitamins and minerals among a particular population (American workers, workers in specific environments, workers who do not go outdoors or who always work outdoors) and the health risks associated with job types (office work, mining work, etc.).</p>

<p>Observe health code/sanitation requirements.</p>	<p>Research the development of health code and sanitation requirements, including OSHA.</p> <p>Compare/contrast workplaces of 1850, 1900, 1950, and 2000 regarding health and safety.</p> <p>Discuss the most common workplace violations of health requirements, and present in a graphic format (e.g., maps, charts).</p> <p>Discuss potential effects of ignoring health requirements.</p> <p>After identifying workplace hazards, create several plans to treat the problem. Debate the benefits of each.</p> <p>To avoid the threat of employers choosing ineffective means of ensuring safety on the job, locate MSDS sheets, first aid stations, personal protective equipment, worker's compensation claims offices/paperwork, etc.</p> <p>Using workplace materials*, locate the section on safety regulations. Ask students to rank order the items. Debate the importance of each. Determine the threat of ignoring regulations. Research which regulations are often disregarded.</p> <p>Explore proactive measures students can take to extend their health.</p> <p>Understand the importance of mental health in addition to physical health.</p>
<p>Investigate/apply principles of anatomy and physiology.</p>	<p>As relating to your industry, explore issues relating to anatomy and physiology.</p> <p>Skeletal system – study the bones of the arm, hand, and neck. Research carpal-tunnel syndrome.</p> <p>Fractures – identify the types of fractures and those most common to your line of work. Learn how to prevent falls.</p>

Crosswalk to SkillsUSA Cosmetology

Student organization information correlates to course content. Student organization activities enable students to apply and practice competencies as they master them. Cosmetology course curriculum correlates to the SkillsUSA Cosmetology contest.

Purpose

To evaluate each contestant's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of cosmetology. First, refer to General Regulations, Page 9.

Clothing Requirement

For men: official SkillsUSA white work shirt, black dress slacks, black socks, and black leather work shoes

For women: official white top, black dress slacks, black socks or black or skin-tone hose, and black leather work shoes.

For models: businesslike, white collarless blouse; black dress slacks or skirt; black or skin-tone hose; and black shoes.

To purchase official clothing, contact Midwest Trophy Manufacturing Co. Inc. by calling 1-800-324-5996 or order online at <http://www.mtmrecognition.com/skillsusa/>.

Eligibility

Open to active SkillsUSA members enrolled in programs with cosmetology as the occupational objective

Equipment and Materials

Supplied by the technical committee

- Vanities, mirrors, tables, and styling chairs
- Hair dryers, towels
- All necessary information and supplies for judges and technical committee
- Any and all pictures or literature of styles, haircuts, and technicals

Supplied by the contestant

- Scissors
- Razor with spare blade
- Thinning scissors
- Curling iron
- Blow dryer

- Sanex (neck strips)
- Hair spray
- Combs
- Brushes
- Styling lotions
- Spray bottle (filled with water)
- Rollers (no brush or Velcro types permitted)
- Clippies or hair clips

Optional

- Clipper
- Bobby pins and hair pins
- Stove and Marcel iron

Note: Other items brought by the contestant will be subject to approval of the national technical committee and must be declared at time of site kit check.

Scope of the Contest

Contestants will demonstrate their ability to perform jobs or skills selected from the following list of competencies as determined by the SkillsUSA Championships technical committee. Committee membership includes Burmax Co. Inc., Milady Publishing Co., JC Penney Co., Pivot Point International Inc., Supercuts Inc., Wella Classic, Hair Cuttery, Fatastic Sams.

Cutting and Shaping Hair on Mannequin or Model

- Must be able to duplicate a predetermined haircut, which has been selected by the national technical committee
 - Scissors and/or razor (clipper optional)
 - Razor only
 - Setting and combing hair on mannequin or model
- Must be able to wet set hair using all of the following:
 - Pin curls
 - Rollers
- Must be able to execute a predetermined style using
 - Blow dryer
 - Curling iron
 - Finger drying (air forming with blow dryer and fingers only)
 - Styling on mannequin or model
- Must be able to
 - Duplicate a predetermined style
 - Set and comb out a daytime and evening hairstyle
 - Create a long hair design
 - Hair coloring and lightening on mannequin or model

- Must be able to demonstrate or be tested on
 - Performing skin sensitivity test
 - Application and use of hair color and lightener
 - Curling and relaxing hair on mannequin or model
- Must be able to demonstrate or be tested on
 - Perm waving
 - Relaxers
 - Communication skills
- Must be able to
 - Follow oral and written instructions
 - Complete written problematic tests
 - Respond to oral questions
 - Demonstrate customer service skills on the phone
 - Demonstrate oral presentation skills [166 *SkillsUSA Championships Technical Standards (2002-2004)*]

Contest Instructions

The national technical committee will develop a contest from the stated competency list.

Models

- Models must be active SkillsUSA members of the same state SkillsUSA association as the contestants in either secondary or postsecondary divisions and may be enrolled in any vocational program. They will be recognized at the awards program along with the contestant.
- Models must be supplied by the contestants and must have hair of sufficient length to execute the selected style.
- Model's hair must be shampooed, cut, and dried before reporting to the contest site.
- Model's makeup (if needed) is to be applied only by the contestant – daytime style (may or may not be included in competition).
- The contestant, and only the contestant, must choose a style that is suitable to his or her model and must be able to execute the proper technical concepts required on the model.
- The contestant will do a complete set and full comb out of a daytime style on his or her model, which will be judged (use of current trend optional).
- No mechanical devices are to be used for the daytime style – such as blow dryers, curling irons, crimping irons, electric rollers, brushes, or hot combs

Evening Style

- Contestants will be asked to set and comb out an evening style. If the day set is included in the contest, contestants will be asked to brush out the day style and recomb the same head for an evening style

- No hairpieces, weaving, ornaments, extensions, ribbons, headbands, or color spray may be added to the hair in any portion of the contest. Only the hair growing from the model's head may be used to create the style.
- Blow dryers, curling irons, Marcel irons, and stoves are permitted during the evening style. Use of styling products is acceptable. Rewetting the hair is not acceptable.
- Earrings may be used but must not be worn until the hair has been completely combed in an evening style.

Mannequins

- Haircut and Air Form Design A – scissors, razors, and thinning shears may be required to complete haircut (clippers optional)
 - Blow dryers and curling irons may be required to complete blow styling.
 - Note: The technical committee will supply mannequins and holders. If this changes in a given year, contestants will be told in advance to bring their own mannequins and holders.
- Long Hair Design
 - Competitors will have 1 hour and 30 minutes to create a long hair design.
 - Any techniques may be used (braiding, twisting, rolls, loops, etc.). Competitors must bring their own rubber bands or bobby pins.
 - No hairpieces or ornamentation allowed.
 - Competitors may apply makeup to the mannequin, but they must complete the application during the time allocated.
 - No haircutting allowed (slight trimming on the ends is OK).
- Razor Cut and Finger Drying
 - Competitors will have 1 hour to cut and finger dry a complete short hair design.
 - Haircut must be performed on wet hair using only the razor and combs (no shears).
 - Drying and styling must be performed with the blow dryer and fingers (no brushes or combs).
 - All styling products may be used.
- Immediately after orientation, the contestants will be divided into secondary and postsecondary groups. Each will be given a number and asked to approach the judges one at a time to respond to one question. Answers should be completed within 1-2 minutes. Contestants may be asked to simulate a phone conversation and demonstrate customer service skills.
- Contestants will be asked to present their completed evening style to the audience and judges during the parade finale. Presentations should last approximately 1 minute.
- In general, judges will look for balance, control of texture, and control of direction in the finished designs. *Sponsored by Goodheart-Willcox Publisher 167.*

Arkansas' All Aspects of Industry

Defining *All Aspects*

All aspects of an industry include, with respect to a particular industry that a student is preparing to enter, planning, management, finance, technical and production skills, underlying principles of technology, labor and community issues, health and safety, and environmental issues related to that industry. Planning is examined at the level of both an individual business and the overall industry. Planning elements might include

- developing strategic plans — mission, vision, goals, objectives, and/or a plan of action;
- working with planning tools such as surveys, market research, and competitive analysis;
- anticipating needs for staffing and major purchases of equipment and supplies;
- developing plans for training and upgrading of staff;
- forecasting market trends; and
- developing business plans for entrepreneurial ventures.

Management addresses methods typically used to manage enterprises over time within the industry, as well as methods for expanding and diversifying workers' tasks and broadening worker involvement in decisions. Key elements of management might include

- using an organization chart to explain how a corporate chain of command works;
- providing input for strategic plans, and communicating the company's vision and mission statements;
- leading employees in carrying out strategic plans and action plans;
- evaluating employee performance;
- anticipating technology and other major purchasing needs;
- ensuring equity and access for employees;
- resolving conflicts;
- developing job descriptions and written policies/procedures;
- identifying recruitment procedures, training opportunities, methods of evaluation, and retention strategies; and
- working with professional associations and community outreach efforts.

Finance examines ongoing accounting and financial decisions and different methods for raising capital to start or expand enterprises. Finance functions might include

- developing budgets;
- preparing financial statements;
- analyzing and managing financial transactions and records;
- implementing payroll procedures;
- determining and paying taxes;
- identifying indirect wage costs (benefits, FICA, insurance, worker's compensation);
- making loans and granting credit to customers;

- developing graphs and charts related to company finances;
- identifying and implementing methods of sustaining profitability of a business;
- managing 401K plans; and
- identifying sources of capital.

Technical and production skills cover specific production techniques and alternative methods for organizing the production work, including methods that diversify and rotate workers' jobs. Technical and production skills that an employee should have to succeed in a business or industry might include

- developing and upgrading job-specific skills;
- using troubleshooting and problem-solving techniques;
- analyzing information to make decisions;
- identifying and implementing quality assurance techniques;
- employing communication skills such as writing, listening, speaking, and reading;
- participating in team efforts;
- implementing projects and new techniques;
- demonstrating basic computer skills; employing time management techniques in completing projects and assigned tasks; and
- demonstrating ethical behavior and work ethic.

Underlying principles of technology provide an integrated study across the curriculum of the mathematical, scientific, social, and economic principles that underlie the industry's technology. Principles of technology that an employee should know might be demonstrated by

- exhibiting proficiency in mathematical and scientific functions related to new and emerging technologies;
- continuously upgrading job skills needed to implement new technologies;
- participating in industry certification programs;
- cross-training to enhance one's value to the organization and to enhance job promotion opportunities; and
- understanding and adhering to ethical issues related to technologies.

Labor Issues examine worker rights and responsibilities, labor unions and labor history, and methods for expanding workers' roles. Labor issues might include

- understanding and implementing worker rights and responsibilities;
- working with labor unions;
- keeping abreast of local, state, and federal legislation affecting employee and employer rights and responsibilities;
- negotiating and settling worker disputes;
- identifying certification requirements for specific jobs; and
- analyzing the impact of labor agreements on business operations.

Community issues explore the impact of the industry on the community and the community's impact on and involvement with the industry. Concepts of business and community relations might include

- developing and working with community outreach projects;
- participating on advisory committees and community organizations;
- working with professional associations;
- developing and implementing public relations plans; and
- participating in community service projects.

Health, safety, and environmental issues examine these concepts in relation to both the workers and the larger community. Concepts related to health, safety, and the environment might include

- identifying and implementing federal, state, and local regulations related to the health and safety of employees;
- understanding and strictly adhering to federal, state, and local environmental regulations related to the business;
- identifying job-specific health hazards and safety issues;
- identifying and implementing basic safety and first aid training techniques for emergencies, such as personal illness or injury, tornadoes, fires, nuclear accidents, floods, and incidences of employee-rape or violent behavior;
- communicating safety regulations and plans to employees; and
- working with selected community groups to implement safety programs.