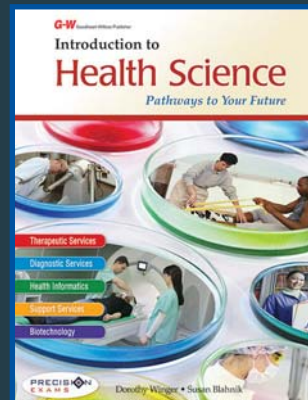
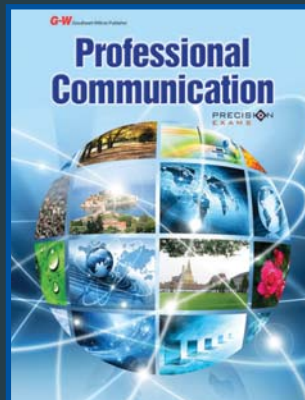
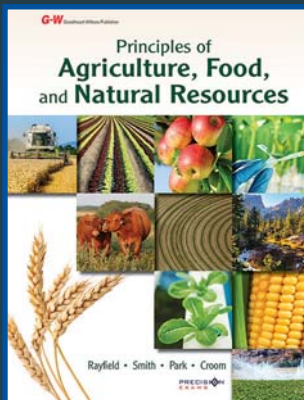


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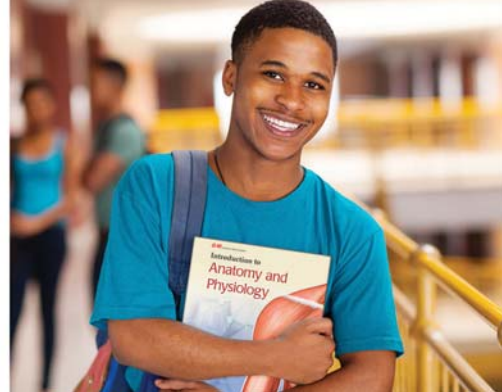
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Contents

Health Science1–4	Arts, A/V Technology, and Communications 17–21	Finance25	STEM.....34–35
Human Services 5–9	Information Technology22	Career Development.....26–27	Transportation, Distribution, and Logistics.....36–39
Hospitality and Tourism 10–12	Marketing23	Education and Training28–29	Manufacturing40
Agriculture, Food, and Natural Resources 13–16	Business Management and Administration 24	Architecture and Construction30–33	

Introduction to Health Science

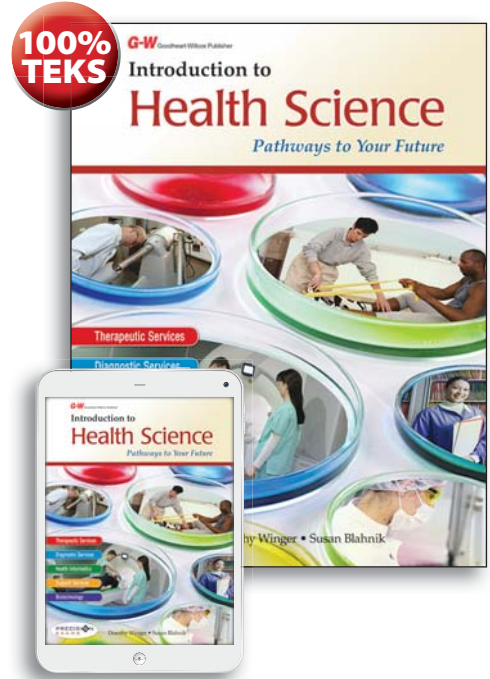
Pathways to Your Future ©2016

by Dorothy Winger and Susan Blahnik

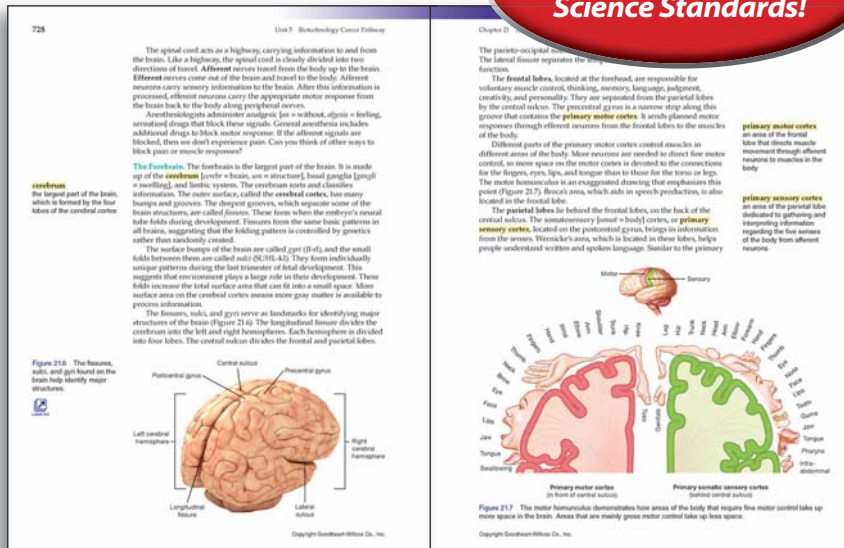
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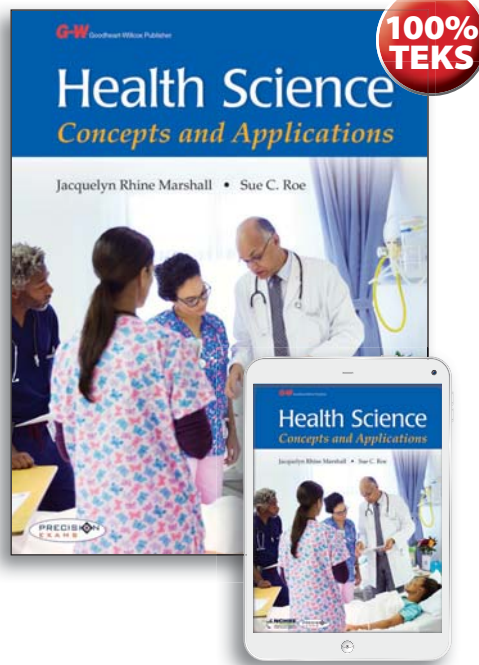
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Concepts and Applications ©2018

by Jacquelyn Rhine Marshall and Sue C. Roe

Health Science: Concepts and Applications provides students with the health science education they need as they begin exploring potential healthcare careers and practicing procedures they will execute on the job. The text covers the academic, professional, and soft skills students will need to succeed in a healthcare career. Coverage of medical math, communication skills, anatomy and physiology, and medical terminology allows students to build a strong academic foundation. Students also learn about the healthcare industry today, careers available in each of the five pathways of the Health Science Career Cluster, and strategies for finding and maintaining a job in healthcare. Hands-on healthcare procedures are included to introduce students to the basic practical skills they will use as healthcare professionals.

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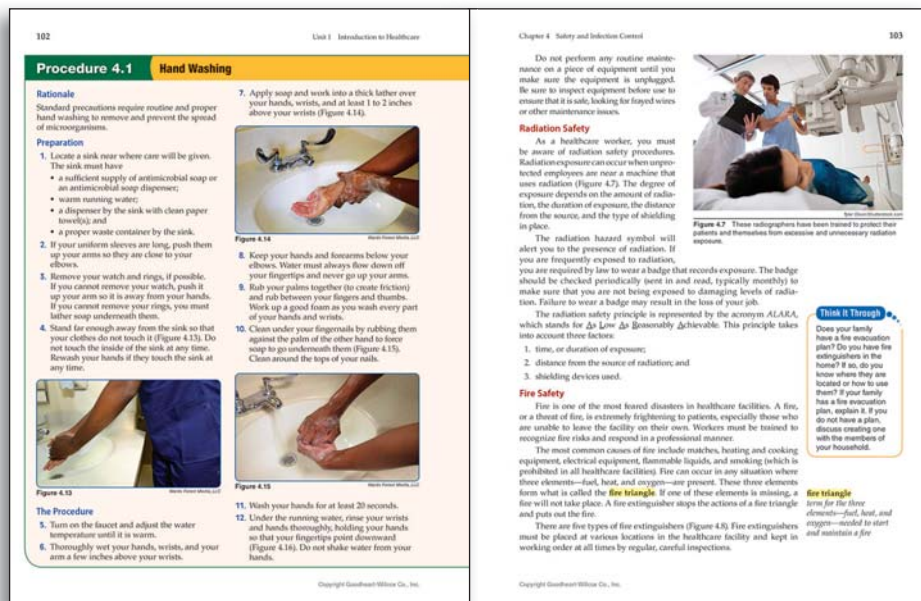
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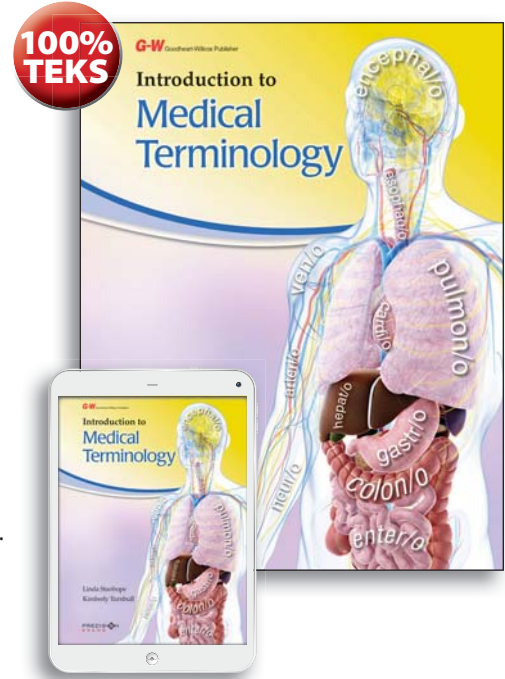
Introduction to Medical Terminology ©2017

by Linda Stanhope and Kim Turnbull

Introduction to Medical Terminology focuses on the essential concepts of human anatomy and physiology and the common medical terms related to the body systems. Each chapter opens with a patient case study that highlights the real-world application of medical terminology. Using a student-friendly approach, chapter content has been logically organized by medical word parts; an anatomy and physiology overview; and coverage of diseases and conditions, diagnostic procedures, surgical and therapeutic treatments, and drug therapies. Each chapter review includes a variety of classroom-proven activities designed to build and reinforce students' medical terminology skills. The text is supported by colorful, detailed art developed by expert medical illustrators.

- This text was created specifically for high school teachers and their beginning students.
- Medical terms are presented in context and dissected into relevant word parts to help beginning students understand the connection between individual word-part meanings and the definitions of terms as a whole.
- Patient medical record activities and other special features throughout the text provide students with valuable critical-thinking opportunities while engaging them with the content.

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CASE STUDY

In the following case study, common medical terms pertaining to the skeletal system are introduced. You will learn more about these terms later in the chapter.

Mary O'Toole, an active, 46-year-old female with a healthy lifestyle, has been suffering from low back pain as well as pain radiating down her right leg and calf. Recently Mary noticed increased aggravation of pain when sitting. She has tried over-the-counter pain medication, including Advil® and Tylenol®, but with no relief. After enduring the pain for two weeks, Mary made an appointment with her internist, Dr. Ferrey. An internist, or internal medicine specialist, is a physician who specializes in the diagnosis, treatment, and prevention of disease in adults.

After examining Mary, Dr. Ferrey referred her to Dr. Peter Lempis, who ordered X-rays of Mary's lumbosacral (L5) spine. The lumbosacral (lum-bo-SAY-kruh) spine is the lower part of the vertebral column, made up of the lumbar region and the sacrum, the bone segment that connects the spine to the pelvis. The X-rays

revealed a 2-centimeter bulge between vertebral disks L5 and S1 (lumbar vertebrae 5 and sacral vertebrae 1).

What kind of procedure will Dr. Lempis recommend to treat Mary's pain? Although you won't be ready to set up your own medical practice and begin treating patients when you finish this chapter, you will be familiar with medical terminology pertaining to the skeletal system, and you will have a much better understanding of Mary's health condition. You will be able to read and interpret Mary's medical record on page 30.

Written by Leading Texas Educators Linda Stanhope and Kim Turnbull

A. Anterior view

B. Lateral view

The bones of the skull. A—Anterior view; B—Lateral view.

by maxillary (MAK-sib-lair-ee) bones form the upper jaw bone.

by mandible (MAN-dib-l) bone forms the lower jaw bone.

by palatine (PAL-uh-tigh) bone forms the posterior part of the hard palate in the mouth.

by lacrimal (LAK-rib-muhl) bones make up part of the eye socket. Each lacrimal bone contains a channel through which tears flow. The word lacrimal comes from the Latin lacrima, which means "tear."

Fascinating Fact: The stapes bone of the middle ear is the smallest bone in the body. It is equivalent to the size of a grain of rice.

Bones of the Thoracic Cage

The thorax, or rib cage, is made up of the sternum, ribs, and thoracic vertebrae. The rib cage, formally called the thoracic (thoh-REAS-ik) cage, is designed to protect many vital organs (Figure 2.5).

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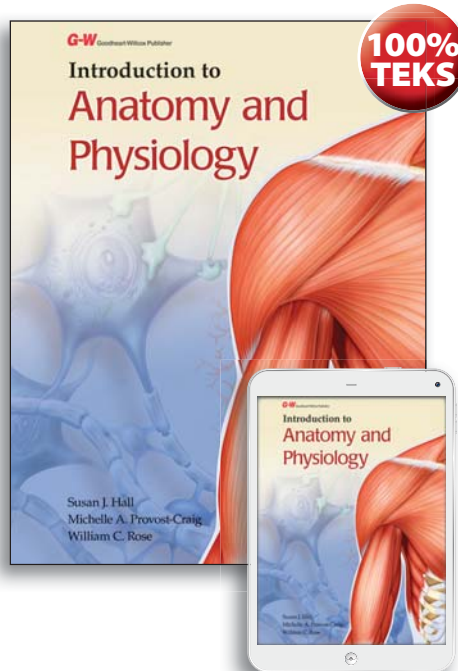
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Introduction to Anatomy and Physiology ©2014

by Susan J. Hall, Michelle A. Provost-Craig, and William C. Rose

Introduction to Anatomy and Physiology covers all body systems using a student-friendly writing style that makes complex subjects easier to understand. Chapter information is divided into lessons, providing content in a more manageable format for the student. An abundance of study aids, such as learning objectives, lesson summaries, vocabulary-building exercises, hands-on activities, real-world applications, and extensive assessment opportunities increase students' ability to succeed in this challenging course.

- Detailed medical art brings the subject matter to life.
- Prominent vocabulary features help students master challenging medical terminology.
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9. The Respiratory System
10. The Blood
11. The Cardiovascular System
12. The Lymphatic and Immune Systems
13. The Digestive System and Nutrition
14. The Urinary System
15. The Male and Female Reproductive Systems



112 Introduction to Anatomy and Physiology

Figure 4.1 A micrograph of trabecular bone tissue. How would you describe the difference between trabecular and cortical bone to someone who knew nothing about these two types of bone tissue?

Most bones include both cortical and trabecular tissue. The function of a given bone determines whether it is composed mostly of cortical or trabecular bone. The outer layer of a bone is always composed of hard, protective cortical bone, with spongy trabecular bone present to varying degrees in the interior of bones. The long bones in the arms and legs are primarily composed of strong cortical bone tissue, although there is trabecular bone inside the ends. The bones in the spinal column contain a large amount of trabecular bone inside their cortical encasings, giving them a certain amount of shock-absorbing capability. Figure 4.2 compares the properties of these two types of bone tissue.

Figure 4.2 Properties of the Two Types of Bone Tissue

	Cortical Bone	Trabecular Bone
Structure	dense	porous (honeycomb structure)
Mineral content	relatively high	relatively low
Strength	relatively high	low
Flexibility	low	relatively more
Shock-absorbing ability	low	relatively more
Primary locations	outer surface of all bones, long bones of limbs	interior of vertebrae, femoral neck, wrist, and ankle bones

Memory Tip
The word *cortical* (coming from *cortex*) pertains to the outer layer of something. For example, the outer layer of the brain is known as the *cortical cortex*. The outer layer of many structures and objects, including a plant stem or even a rock, is also known as its *cortex*. The type of bone tissue forming the outer layer of bone is therefore called *cortical bone*.

Shape Categories of Bones
Because of the large variety of sizes and shapes of the bones in the human skeleton, for purposes of discussion bones are traditionally divided into four categories (Figure 4.3):

1. Long bones have a long, somewhat round shaft made of cortical bone, with bulbous knobs of trabecular bone encased in cortical bone at both ends. The shafts enclose the central hollow medullary cavity or canal. The major bones of the arms and legs are long bones.
2. Short bones are shaped like a cube and are composed mainly of trabecular bone. The bones of the wrist and ankle are short bones.
3. Flat bones are thin, relatively large in surface area, and generally curved to some extent. Structurally, they consist of two thin layers of cortical bone with a layer of trabecular bone in between. These bones function to protect underlying organs and also provide

Figure 4.3 The four shape categories of bones.

large areas for muscle attachments. The scapula and the bones of the skull are considered flat bones.

4. **Irregular bones** are all those bones that do not fit into one of the preceding categories. They have individualized shapes to fulfill specific functions. The bones of the spinal column and hip girdle are in this category.

Anatomical Structure of Long Bones
The **diaphysis** (digh-AF-i-sis) of a long bone is the hollow shaft of the bone composed of cortical bone (Figure 4.4 on the next page). A fibrous connective tissue membrane called the **periosteum** (PER-ee-AHS-tee-um) surrounds and protects the diaphysis. The periosteum contains blood and lymph vessels, as well as nerves. It is involved in bone growth, repair, and nutrition. The hollow center of the diaphysis, as discussed, is the medullary canal, or cavity. Beginning when a person is about five years old, this cavity is filled with yellow bone marrow, which has a rich supply of blood vessels and is a storehouse for fat. The medullary cavity is lined by a membrane known as the **endosteum** (en-DOS-tee-um).

Check Your Understanding

1. What percentage of bone weight comes from its mineral content?
2. What is collagen?
3. Where is cortical bone typically found?
4. Where is trabecular bone typically found?
5. List the four shape categories of bone.

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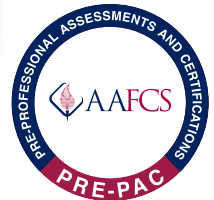
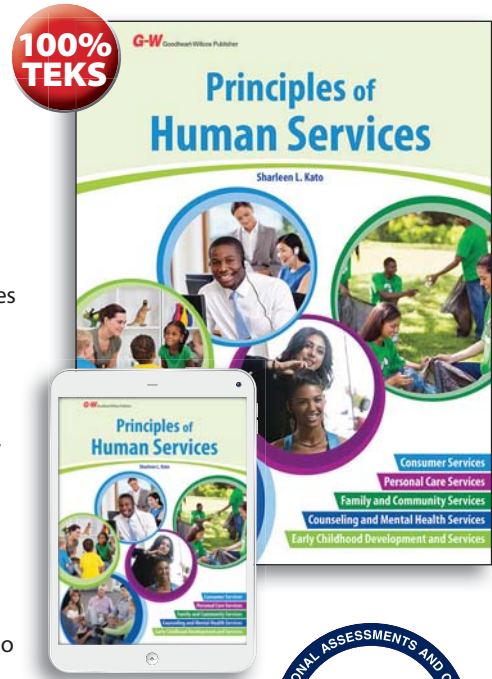
Principles of Human Services ©2018

by Sharleen L. Kato

Principles of Human Services is an introductory text designed specifically for high school students interested in learning about occupations in the field of human services. The text focuses on the five career pathways within the human services career cluster. Human services related careers in food and nutrition, clothing, and housing are also included. This student-friendly text provides a look at the aptitudes, attitudes, and skills; education and training; and specialized knowledge needed to succeed in a wide variety of human services careers. Students can also discover which careers are expected to experience growth in the future. A wide variety of activities provide built-in opportunities for discussion, higher-order thinking, and collaborative learning.

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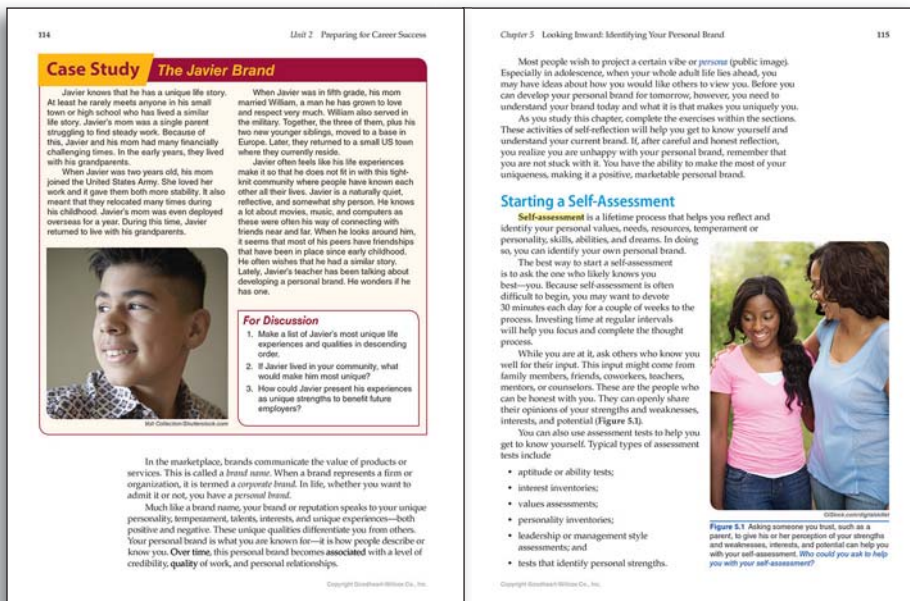
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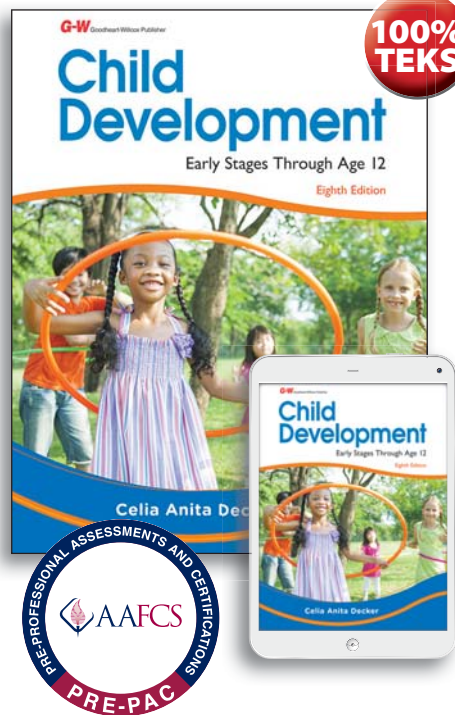
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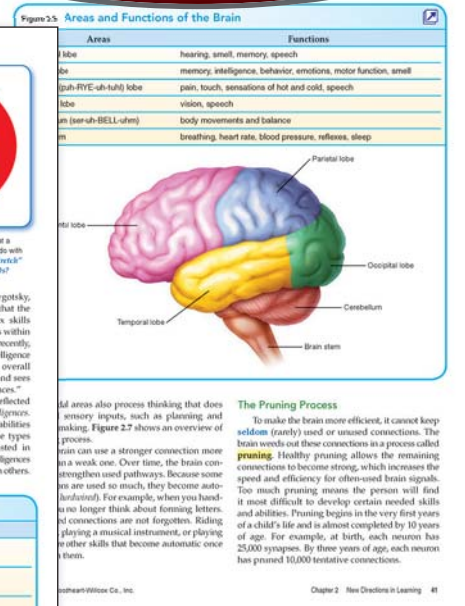
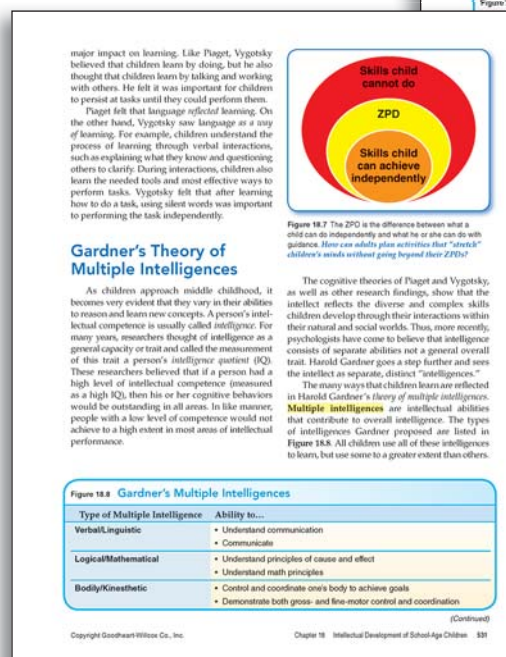
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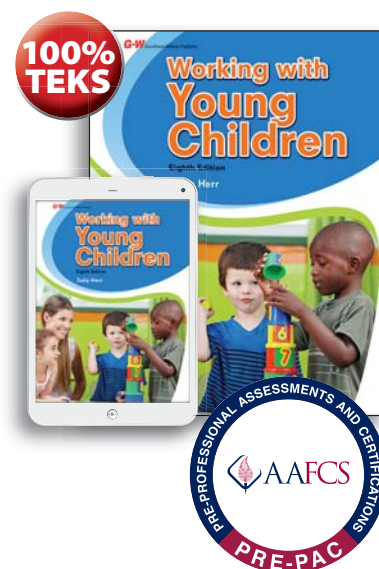
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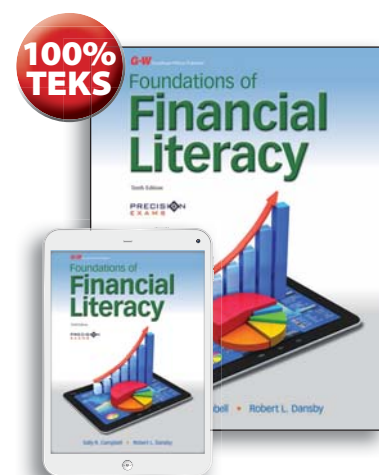
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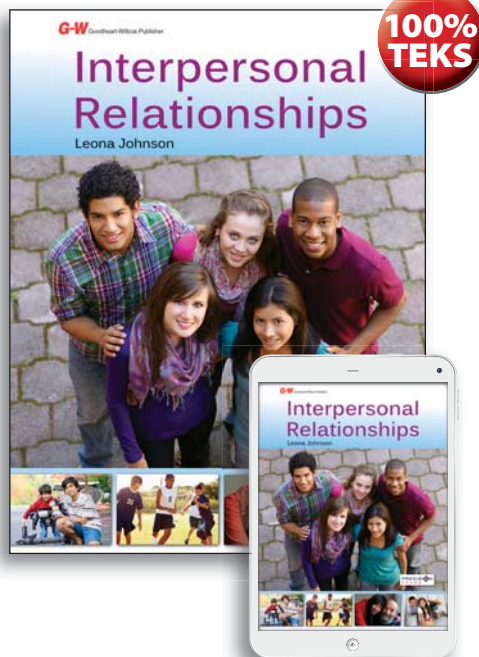


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Interpersonal Relationships ©2018

by Leona Johnson

Interpersonal Relationships is an interactive, comprehensive introduction to relationship skills, including relationships among friends, relationships in the family, and relationships in the workplace. With a contemporary, lesson-based organization and look, **Interpersonal Relationships** is rich with opportunities for real-world application, discussion, and assessment. Case Studies, Getting Started, and Real-Life Scenarios help students envision chapter concepts and apply chapter skills to their lives. Key terms and academic terms aid students in learning vocabulary. Lesson Comprehension Checks assess student understanding periodically to maximize learning.

- Numerous features invite students to apply chapter concepts to their own lives and to the lives of people all around the world.
- *Reading Prep*, *Focus Your Reading*, and *Think About Your Reading* activities prompt students to engage critically with the text.
- A variety of rich, real-world activities reinforce chapter information and challenge students to analyze and use the information individually and in small groups.

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CONTENTS

Reaching Your Potential

1. A Close-Up View of You
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Setting and Reaching Life Goals

4. Developing Decision-Making Skills
5. Choosing a Career
6. Managing Time to Reach Your Goals

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7. Developing Communication Skills
8. Developing Relationship Skills
9. Developing Group Interaction Skills

Romantic Relationships

10. Dating Relationships
11. Choosing to Marry
12. Adjusting to Marriage

Family Relationships

13. Today's Family
14. Strengthening Family Interactions
15. Individual and Family Crises
16. Divorce and Remarriage

Family Relationships Over Time

17. The Early Years of the Family Life Cycle
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Guide to Good Food

Nutrition and Food Preparation ©2018, 14th Edition

by Velda L. Largen and Deborah L. Bence

Guide to Good Food: Nutrition and Food Preparation employs current nutrition information to inform students as they learn the roles nutrients play in their health throughout the life cycle. Comprehensive content on food selection, storage, preparation, and service gives students the tools needed to recognize and follow a nutritionally balanced diet, while animations bring content to life. Menus and recipes with easy-to-follow, step-by-step directions, and nutritional analyses are also included. Food-related careers are profiled in every chapter.

- Enhanced visuals program employs infographics and images to emphasize content and improve recall.
- The *Foods of the World* section explores the culture and cuisine of over 30 countries.
- Students can complete and submit review questions digitally, enhancing instructor's assessment of students' comprehension and reducing paper waste.

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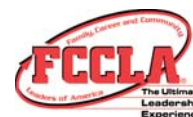
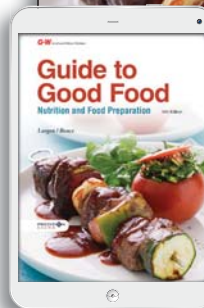
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Guide to Good Food

Nutrition and Food Preparation 14th Edition

Largen / Bence



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- Food Affects Life
- Safety and Sanitation
- Basic Skills and Equipment
- Recipes and Work Plans
- Preparing Simple Recipes

Nutrition and Wellness

- The Energy Nutrients
- Vitamins, Minerals, and Water
- Making Healthy Choices
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- Kitchen Appliances
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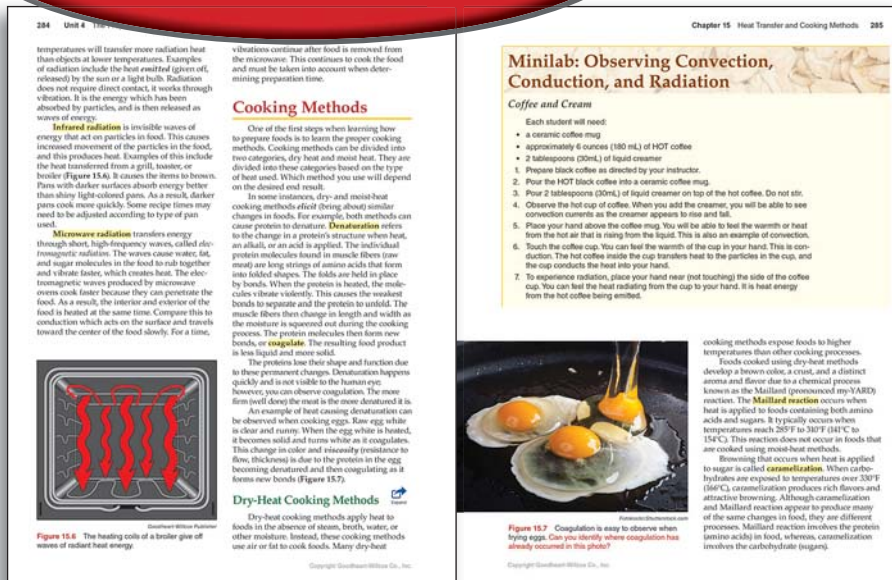
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- Beans
- Vegetables
- Fruits
- Dairy Products
- Eggs
- Meat
- Poultry
- Fish and Shellfish
- Salads, Casseroles, and Soups
- Cakes, Cookies, Pies, and Candies
- Food and Entertaining
- Preserving Foods

Foods of the World

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- Latin America
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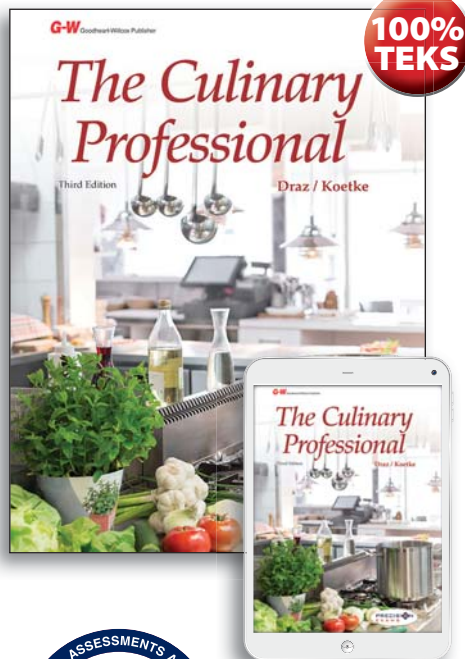
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The Culinary Professional

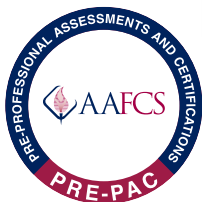
©2017, 3rd Edition

by John Draz and Christopher Koetke

The Culinary Professional rates high in user satisfaction for its approachable writing and design. Instructors appreciate its visual appeal, citing images that are “up-to-date and meaningful.” Expanding further on the visual elements, this edition incorporates animations that reinforce key concepts and techniques. With this new, updated edition, authors and chefs John Draz and Christopher Koetke have continued to focus on the core content that provides students with the knowledge they need for a career in the culinary arts.

- **New!** Correlates to Precision Exams standards preparing student to earn a certificate in Food Service/Culinary Arts.
- **New!** Includes animations, interactive activities, and video clips to enhance experience for visual learners.
- Addresses the American Culinary Federation Education Foundation standards for Secondary Certified Programs. (Certified Junior Culinarian certification)

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CONTENTS

Introducing the Foodservice Industry

1. Welcome to the Foodservice Industry
2. Understanding Foodservice Operations
3. Culinary History
4. Workstations in the Professional Kitchen
5. The Professional Chef
6. Entering the Workforce

Culinary Fundamentals

7. Sanitation Hazards
8. Sanitation Procedures
9. Safety in the Kitchen
10. Sustainability in the Kitchen
11. Knives and Hand Tools in the Professional Kitchen
12. Knife Skills
13. Smallwares
14. Large Equipment
15. Using Recipes
16. Basic Preparations—Mise en Place
17. Kitchen Staples
18. Cooking Principles

Ingredients, Preparation, and Presentation

19. Salads and Dressings
20. Fruit Identification
21. Fruit Preparation
22. Cold Sandwiches
23. Stocks
24. Sauces
25. Soups
26. Vegetable Identification
27. Vegetable Cookery

28. Starch Identification
29. Starch Cookery
30. Meat and Poultry Identification
31. Basic Meat and Poultry Preparation
32. Dry-Heat Cooking Methods for Meat and Poultry
33. Moist-Heat and Combination Cooking Methods for Meat and Poultry
34. Fish and Shellfish Identification
35. Fish and Shellfish Preparation and Cookery
36. Hot Sandwiches and Pizza
37. Dairy and Egg Identification
38. Breakfast Cookery
39. Food Presentation

In the Bakeshop

40. Introduction to the Bakeshop
41. Quick Breads and Batters
42. Cookies
43. Yeast-Raised Products
44. Pies and Tarts
45. Cakes
46. Custards, Foams, and Buttercreams
47. Dessert Sauces and Frozen Desserts

Beyond Cooking

48. Table Service
49. Managing Resources
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Hospitality Services

by Johnny Sue Reynolds and Dorothy M. Chase

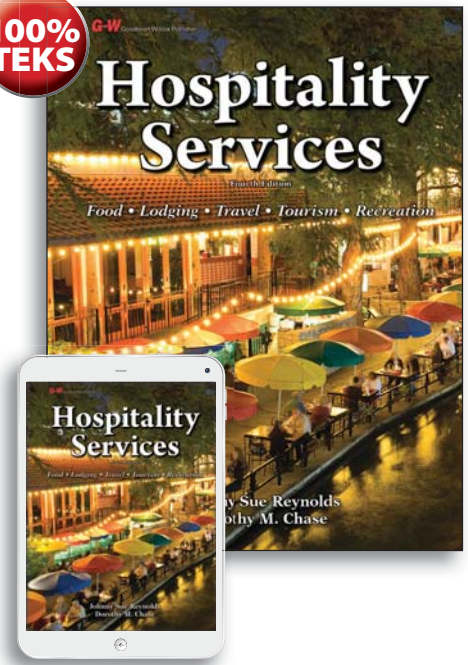
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Hospitality Services introduces students to the five segments of the hospitality industry—food and beverage, lodging, travel, tourism, and recreation. The business aspects of these areas are covered, including hospitality management, human resources, accounting, sales, and marketing. Additionally, the roles, responsibilities, and required skills of individuals choosing hospitality as a career path are included.


- Career planning chapters lead students through researching careers, succeeding in the workplace, and starting their own businesses.
- Customer service and industry-wide technology are discussed throughout the text.
- *Hospitality Ethics* and *Going Green* features address industry hot topics. Profiles spotlight successful hospitality professionals to inspire students and demonstrate career options.

TEKS Correlations available at www.g-w.com/texas



Incorporate trending industry topics into your class, including ethics and "going green"

8 Unit One Welcome to Hospitality



1-3 Theme parks are part of the hospitality industry.

Food

The food segment of the hospitality industry consists of businesses that prepare food and beverages for customers. It is also called the **foodservice** industry. A foodservice business can range from casual to fancy. For example, both a sidewalk hot dog vendor and an elegant restaurant are food businesses, 1-5. The business can be large or small. The hot dog vendor is a small business. McDonald's Corporation, which owns and operates McDonald's restaurants, is one of the largest businesses in the world.

Many foodservice businesses are located in another business. For example, foodservice businesses are often located in movie theaters, malls,

Segments of the Hospitality Industry		
Segment	Categories in Segment	Examples
Food and Beverage	Quick-service restaurants, full-service restaurants, street vendors, carryout, caterers	McDonald's, Olive Garden, Good Humor trucks, Taco Bell, your school cafeteria
Lodging	Hotels, motels, inns, bed-and-breakfasts, hostels, campsites	Hilton Hotels, Budget Suites, Holiday Inn, KOA Campsites
Travel	Rental cars, buses, trains, airplanes, cruise ships, travel agents	Avis Rent a Car, Greyhound Bus, Yellow Cab, Amtrak, Southwest Airlines, Princess Cruises, Adventure Travel
Tourism	Tour companies, tourism offices, convention and visitors bureaus	Vermont Bike Tours, Indiana Tourism Council, Chicago Convention and Visitors Bureau
Recreation	Amusement parks, theme parks, nature parks, museums, movie theaters, sports arenas, concert halls, participatory sports	Six Flags, Disneyland Resort, Grand Canyon National Park, The Art Institute of Chicago, Sorny Movie Theaters, Comerica Field House, Carnegie Hall, Blue Mountain Ski Area

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1-4 Identify two segments of the hospitality industry and discuss how they relate to each other.



1-6 This luxury hotel is part of the lodging segment.

convenience and low price. Examples of lodging businesses range from the elegant Ritz-Carlton Hotel in New York City and the reasonably priced Embassy Suites Hotels to the inexpensive Motel 6. A bed-and-breakfast in a private home is also part of the lodging industry. There are almost five million guest rooms in approximately 52,000 different properties throughout the United States. There are about 13 million guest rooms worldwide. Campgrounds are also part of the lodging industry.

Travel

The travel industry consists of businesses that physically move travelers from one place to another. These businesses include car rentals, taxi and ferry services, train and bus services, and airlines. Travel includes trips of varying lengths—from overnight stays to round-the-world vacations involving several destinations and weeks of travel.

Travel for pleasure has changed in recent decades. Previously, Americans took week-long vacations and stayed with relatives or friends. Now

CONTENTS

Welcome to Hospitality

1. The World of Hospitality
2. Service: The Heart of Hospitality
3. Hospitality Past, Present, and Future

The Foodservice Industry

4. The World of Food and Beverages
5. Food Preparation and Service
6. Front and Back of the House
7. Hotel Food and Beverage Services
8. Purchasing and Receiving
9. Food Safety and Sanitation

The Lodging Industry

10. The World of Lodging
11. Front Office
12. Housekeeping
13. Security
14. Engineering

Travel, Tourism, and Recreation

15. Travel
16. Tourism
17. Recreation

The Business of Hospitality

18. Business Basics
19. Hospitality Management
20. Human Resources
21. Marketing and Sales
22. Accounting
23. Workplace Safety and Emergencies
24. Legal and Ethical Considerations

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25. Your Career in Hospitality
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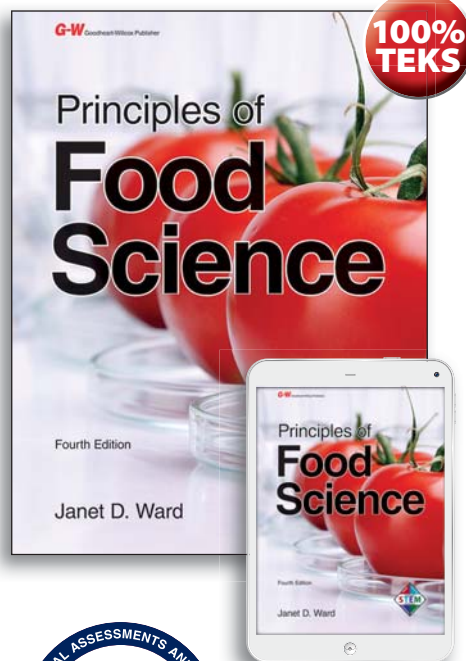
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Principles of Food Science

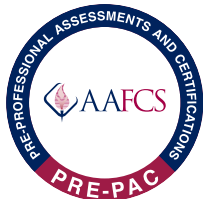
©2015, 4th Edition

by Janet D. Ward

Principles of Food Science demonstrates how the laws of science are at work in producing, processing, preparing, preserving, and metabolizing food. Students learn how cooking, health, and storage tips connect science basics to daily food encounters. The text covers the basic laws of chemistry, microbiology, and physics as they are applied to food components and complex food systems. Students learn scientific facts and principles that can be applied to a future food science career and also to more creative, nutritious home cooking. The requirements and opportunities for obtaining a food science career are explored, as well as the impact of this career path on local, national, and global economies.

- Numerous lab experiments help students apply basic math and technical writing skills to real-world food problems.
- The value of different types of evaluations—scientific vs. sensory—are examined, with applications to school lab experiments and commercial food product development.
- Lessons emphasize the importance of lab safety, teamwork, attention to detail, and high ethical standards.

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CONTENTS

The Science of Food

1. Food Science: An Old but New Subject
2. Scientific Evaluation: Being Objective
3. Sensory Evaluation: The Human Factor

Basic Chemistry

4. Basic Food Chemistry: The Nature of Matter
5. Energy: Matter in Motion
6. Ions: Charged Particles in Solution
7. Water: The Universal Solvent

Organic Chemistry:

The Macronutrients

8. Sugar: The Simplest of Carbohydrates
9. The Complex Carbohydrates: Starches, Cellulose, Gums, and Pectins
10. Lipids: Nature's Flavor Enhancers
11. Proteins: Amino Acids and Peptides
12. Enzymes: The Protein Catalyst

Food Chemistry:

The Microcomponents

13. The Micronutrients: Vitamins and Minerals
14. Phytochemicals: The Other Food Components
15. Food Analogs: Substitute Ingredients

16. Additives: Producing Desired Characteristics in Foods

Food Microbiology: Living Organisms in Food

17. Fermentation: Desirable Effects of Microbes
18. Food Safety: Sources of Contamination

Food Preservation and Packaging

19. Thermal Preservation: Hot and Cold Processing
20. Dehydration and Concentration: Controlling Water Activity
21. Current Trends in Food Preservation: Irradiation, Packaging, and Biotechnology

Working with Complex Food Systems

22. Mixtures: Solutions, Colloidal Dispersions, and Suspensions
23. Separation Techniques: Mechanical and Chemical Methods
24. Research: Developing New Food Products
25. Food Science Related Careers: A World of Opportunities

Special Topics

- Food Labeling
- Nutritional Guidelines
- Digestion and Metabolism
- Career Success



Unit 4 Food Chemistry: The Microcomponents

UNDER THE MICROSCOPE Careers in Food Science

Food Science Technician

Are you curious about the foods and food products you eat? Do you like to analyze problems, conduct experiments, and find solutions to problems? If you do, perhaps a career as a food science technician is ideal for you.

Food science technicians work alongside food scientists or technologists and/or soil and plant scientists in research and development, food production technology, and quality control. They may conduct standardized tests to determine the chemical properties of foods and beverages. For example, these technicians may test foods for certain additives to make sure they comply with federal guidelines. Additional responsibilities include such tasks as recording or compiling test results, analyzing test results by comparing them with standard tables, and cleaning lab equipment.

Beyond their laboratory skills, food science technicians need effective communication skills. They often report their findings in both oral and written reports. Strong computer skills, organizational ability, attention to details, analytical ability are also requirements of these positions.

- **Education and training.** Food science technicians generally need an associate's degree in applied science or science-related technology. Depending on the employer, some positions require a high school diploma and on-the-job training.
- **Work environment.** Most food science technicians work indoors in laboratories. They have regular work hours, although some may occasionally work nontraditional hours when monitoring various experiments.
- **Job outlook.** Job growth is anticipated to be as fast as average. Because of the importance of balancing greater agricultural production with protecting soil and water resources, research in agricultural and food science will remain a need.
- **Wages or salary.** Median wages for food science technicians average about \$16.00 per hour.

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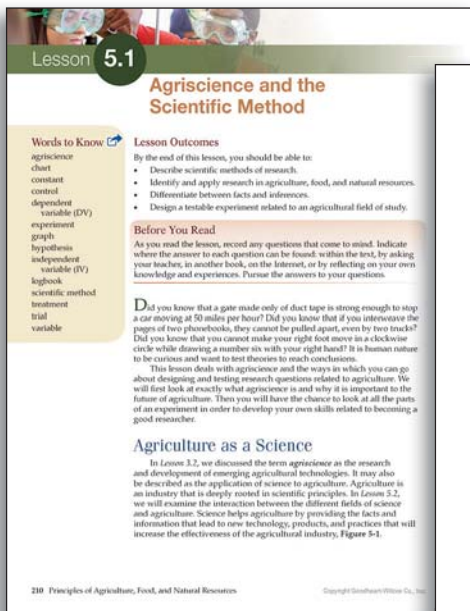
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by John S. Rayfield, Kasee L. Smith, Travis D. Park, and D. Barry Croom

This comprehensive new text welcomes today's learners to the diverse and exciting world of agriscience and prepares them for more advanced courses. Written by leaders in agricultural education, **Principles of Agriculture, Food, and Natural Resources** provides a fresh, visual, and highly applied introduction to the systems and concepts that define modern agriculture, including food systems and natural resources. Reading and critical thinking skills are developed by several features in each lesson, including "Before You Read," "Analyze and Apply," and "Thinking Critically." All of these challenge learners to research topics in depth and to apply what they have learned.

- **STEM Connections** appear frequently within lessons and challenge learners to apply AFNR concepts more generally.
- Students can explore the various types of supervised agricultural experiences (SAEs) and the use of the Agricultural Experience Tracker (AET).
- The text provides practical information on building leadership, communication, and parliamentary procedure skills.

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**Introduction to
modern agriculture written
by leading educators!**



Figure 5-1. Agriscience involves the scientific development of research questions related to agriculture. Can you think of an agricultural topic you might like to investigate?

Before we discuss the application of scientific principles to agriculture, we should first examine the basics of research using scientific methods.

The Scientific Method

The scientific method is a means of research that uses systematic rules and procedures to investigate a problem. It includes the entire research process, including:

- Locating facts.
- Making observations.
- Measurement.
- Experimentation.
- Formulating and testing a hypothesis.

Using the scientific method ensures that research leads to reliable and true results. Figure 5-2.

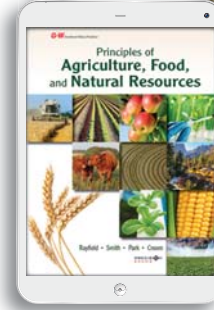
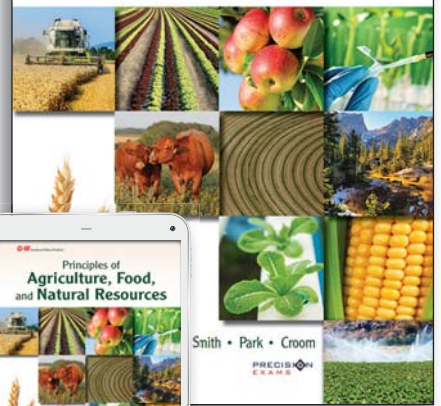


Figure 5-2. By paying careful attention to the steps in the scientific method, you will have the opportunity to create a science experiment that gives you the most accurate answer to your research question.

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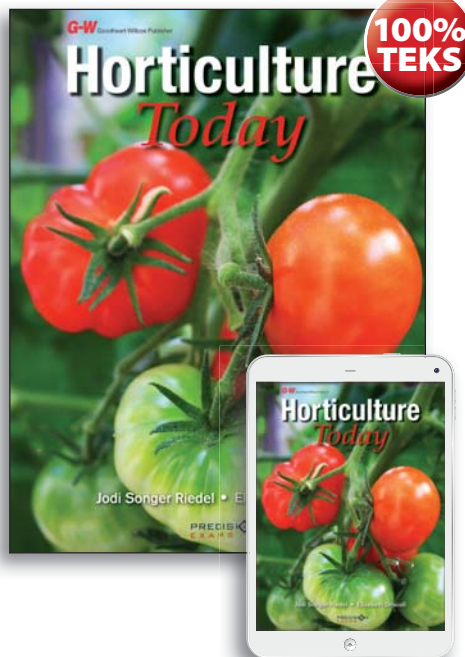
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Horticulture Today ©2017

by Jodi Songer Riedel and Elizabeth Driscoll

An all-new option for introductory horticulture or plant science courses, **Horticulture Today** engages students with practical information they can use and hands-on activities they perform. Written by two dynamic agricultural educators, the text provides a contemporary overview of the horticulture industry, plus thorough coverage of plant science, horticultural practices, landscape design and maintenance, and integrated pest management. In developing an appreciation for the diversity and global context of horticulture, **Horticulture Today** helps students to develop literacy in Green Industry careers as well as the skills they will need to succeed.

- Abundant *STEM Connections* within the text place horticulture and plant science in a broader academic context. *STEM Connections* and *Academic Activities* at the end of each chapter provide additional reinforcement for students and assessment material for instructors.
- Reading and critical thinking skills are methodically developed throughout, while special features like *Corner Questions* pose entertaining and thought-provoking questions that make learning fun.
- To connect classroom and experiential learning, a dedicated chapter on Supervised Agricultural Experiences (SAEs) sets the stage for horticulture as an SAE focus. *SAE Opportunities* provided at the end of each chapter provide an additional springboard for planning and decision-making.

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10. Environmental Conditions for Growth
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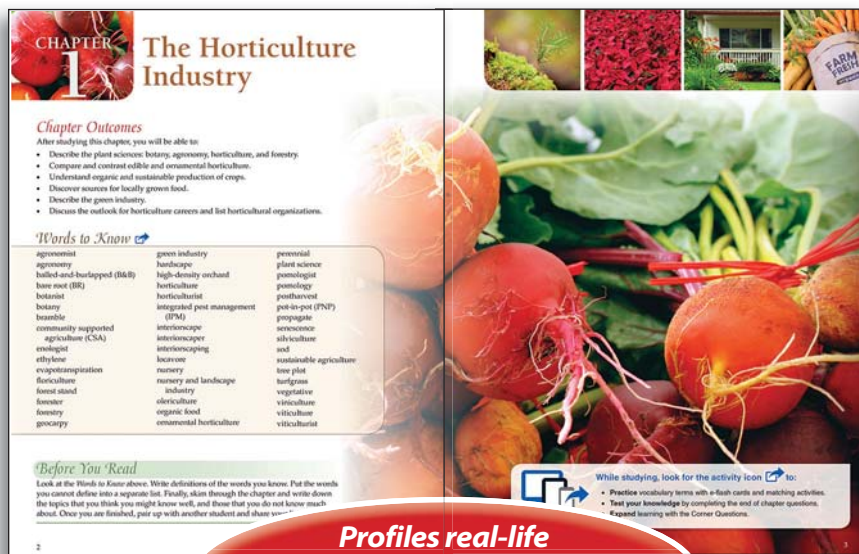
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21. Nursery Production
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23. Fruit and Nut Production

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Agricultural Mechanics and Technology Systems^{©2017}

by J.P. Hancock, Don W. Edgar, Michael L. Pate, Lori A. Dyer, and W. Brian Hoover

Agricultural Mechanics and Technology Systems presents focused, technically accurate coverage of all major skilled trade disciplines in agricultural contexts, including construction, electricity, welding, and power systems. In addition, the text provides a wealth of information and resources on careers in agricultural mechanics and promotes a deep understanding of supervised agricultural experiences (SAEs) and career development events (CDEs).

Agricultural Mechanics and Technology Systems has been designed to support the Power, Structural, and Technical Systems Career Pathway within the National AFNR Career Cluster Content Standards.

- The chapter on Trends and Emerging Technologies introduces students to the many high-tech applications of agriculture and agricultural mechanics, including geographic information systems (GIS), telematics, sustainable energy sources, precision agriculture, wireless sensor networks, and the use of drones.
- A chapter on safety and extensive *Safety Notes* cultivate a safety-first mindset and drive home the point that safe work habits are needed in every domain of agricultural mechanics and technology.
- Reading and writing skills are developed by the careful definition and use of technical terms and by *Before You Read* guidance provided at the start of every chapter.
- *Hands-on Agriculture* and *STEM and Academic Activities* provide engaging, inquiry-based learning activities for students and provide a bridge between theory and practice.
- To highlight safe, correct, and current practices, high-quality photographs and line art accompany text descriptions on nearly every page of the text.

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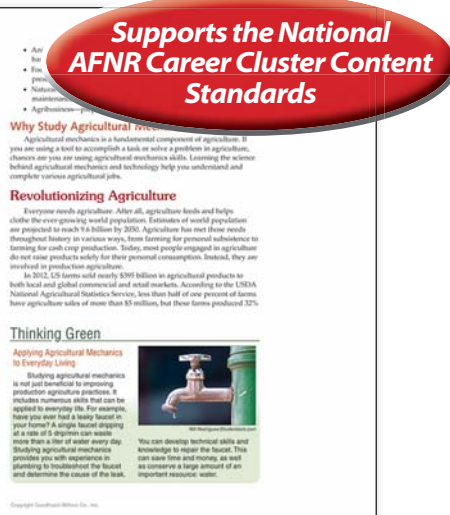


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14. Concrete Foundations and Flatwork
15. Masonry
16. Framing Structures
17. Finishing Structures
18. Specialized Agricultural Structures
19. Fencing and Livestock Structures
20. Electric Theory
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22. Wiring DC Circuits
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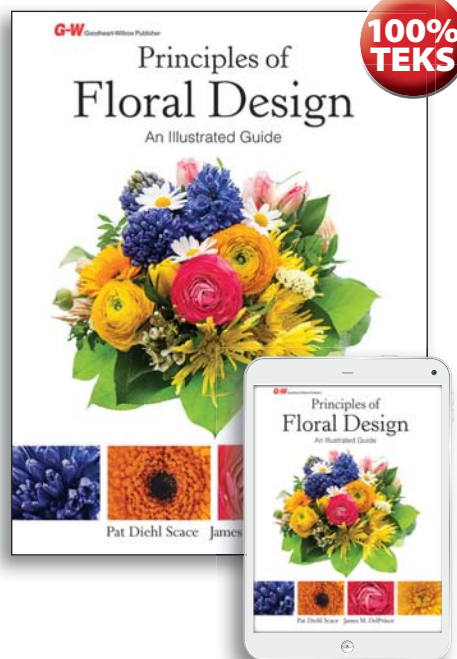
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Principles of Floral Design

An Illustrated Guide ©2015

by Pat Diehl Scace and James M. DelPrince

Principles of Floral Design: An Illustrated Guide provides an introduction to the hands-on skills and theory required for career success in addition to the artistic aspect of floral arrangement. This heavily illustrated text acquaints future floral designers with design principles and elements along with the floriculture industry and its careers. It presents the various types of products used in floral design, before progressing into common floral applications and events. This text is also appropriate for students enrolling in the course for fine arts elective credit.

- Step-by-step procedures provide clear instruction to develop students' floral design skills using low-cost and commonly available materials.
- Extensive flower and foliage glossaries include cross-references to both the common and the botanical names in addition to other helpful information.
- End-of-chapter features, including *Activities*, *Critical Thinking*, *STEM Activities*, and *Communicating about Floral Design*, provide students with the opportunity to connect floral design content to career and college readiness skills.

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What Teachers Are Saying:

"This new book is the best floral design book I have seen."

Former Agriscience/Horticulture Teacher and Member of the FFA National Floriculture Committee

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13. Wedding Flowers
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Apparel

Design, Textiles & Construction ©2018, 11th Edition

by Louise Liddell and Carolee Samuels

Apparel: Design, Textiles & Construction is a comprehensive introduction to the worlds of apparel and fashion with updated information and new and improved illustrations and features. Robust digital offerings also accompany this new edition, including a new companion website with e-flash cards, digital graphic organizers, online chapter reviews, and interactive self-assessment quizzes.

- This edition provides multiple new opportunities for the integration of STEM (science, technology, engineering, and math). Updated STEM features and new STEM-related activities challenge students to apply chapter concepts using these relevant skills.
- New and updated content about global trends and technology in the apparel and textile industries gives students the most current information. An updated design with attractive new illustrations invites students to engage more easily with the text.
- In addition to multiple critical thinking, reading, writing, math, technology, science, and speaking activities, new career readiness activities prompt students to apply chapter content to the workplace.

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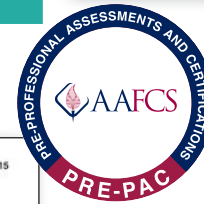
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8. Apparel Decisions and Choices
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10. Choices as a Consumer
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13. Keeping Apparel Looking Its Best
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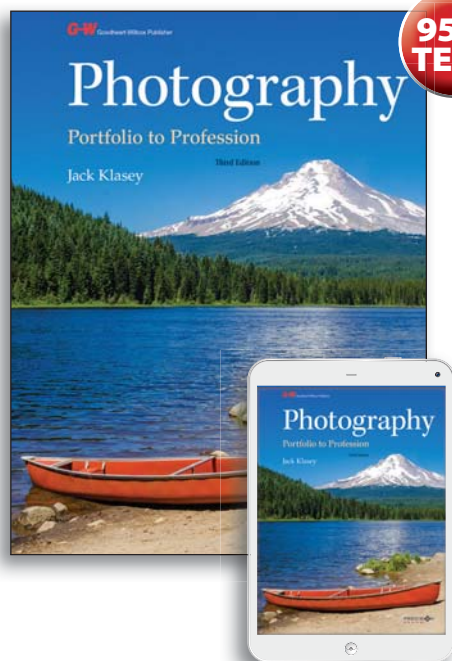
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20. From Yarn to Fabric
21. Fabric Color and Finishes

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22. Figure Types and Pattern Sizes
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29. Preparing for a Career
30. A Job and a Career
31. Entrepreneurship—Profiting from Your Skills

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Photography

Portfolio to Profession ©2017, 3rd Edition

by Jack Klasey

Photography: Portfolio to Profession teaches the principles and skills required to gain competence in digital and film photography. The tools and techniques of color digital photography are emphasized, and a chapter on development and printing of film images is also included. Individual chapters teach techniques for specific photographic situations, such as action and events, outdoor photography, travel photography, and portrait and studio photography. Portfolio Assignments engage students in creating a variety of images and building their own portfolios. An array of digital teaching resources offers convenient methods to engage students and assess their learning.

- A new Commercial Photography chapter gives students a thorough understanding of the setup, marketing, and operation of a photography business and teaches the soft skills required to succeed as a photographer.
- Two “digital darkroom” chapters teach useful image-editing and image-manipulation skills needed to process and enhance images.
- End-of-chapter questions and activities (*Review Questions, Suggested Activities, Critical Thinking* questions, and *Communicating about Photography* activities) reinforce and heighten student understanding of the chapter content.

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CONTENTS

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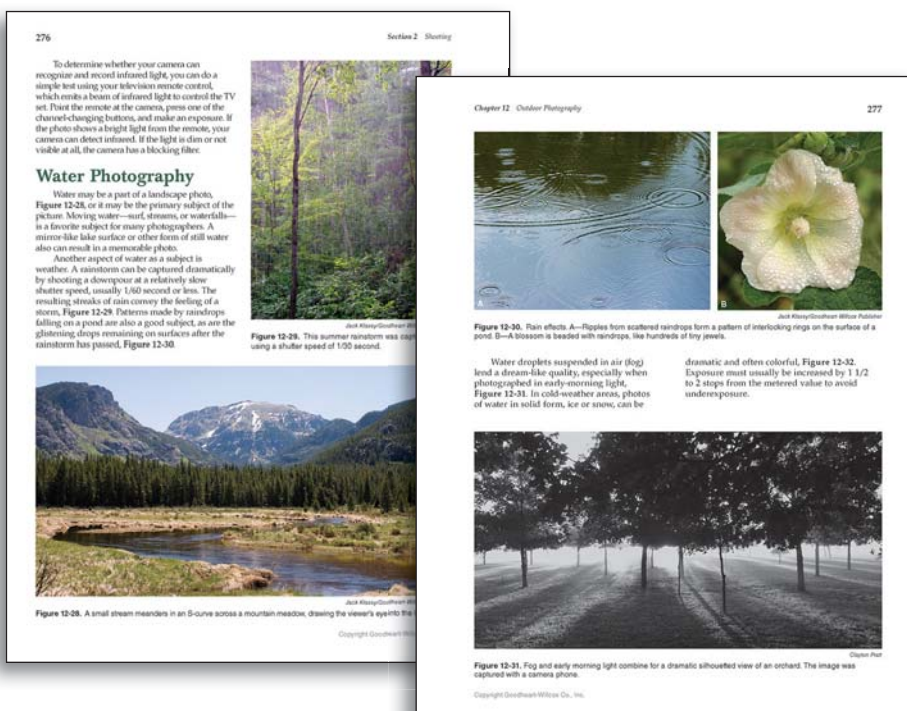
1. Our Visual World
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3. Commercial Photography
4. From Pinholes to Pixels
5. The Camera System
6. Lenses
7. Light and Exposure
8. Image Capture Media

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9. Making a Picture
10. Making Exposure Decisions
11. Action and Event Photography
12. Outdoor Photography
13. Travel Photography
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Television Production & Broadcast Journalism

©2018, 3rd Edition

by Phillip L. Harris and Gil Garcia

Television Production & Broadcast Journalism provides students with basic technical skills necessary to enter the television production industry as a production assistant, and introduces broadcast journalism theory. The text provides an overview of the equipment, job responsibilities, and techniques involved in both traditional studio production and remote location work. The activities and processes involved in each phase of production are presented and reinforced with realistic examples, numerous photos showing students in actual production situations, and engaging student activities.

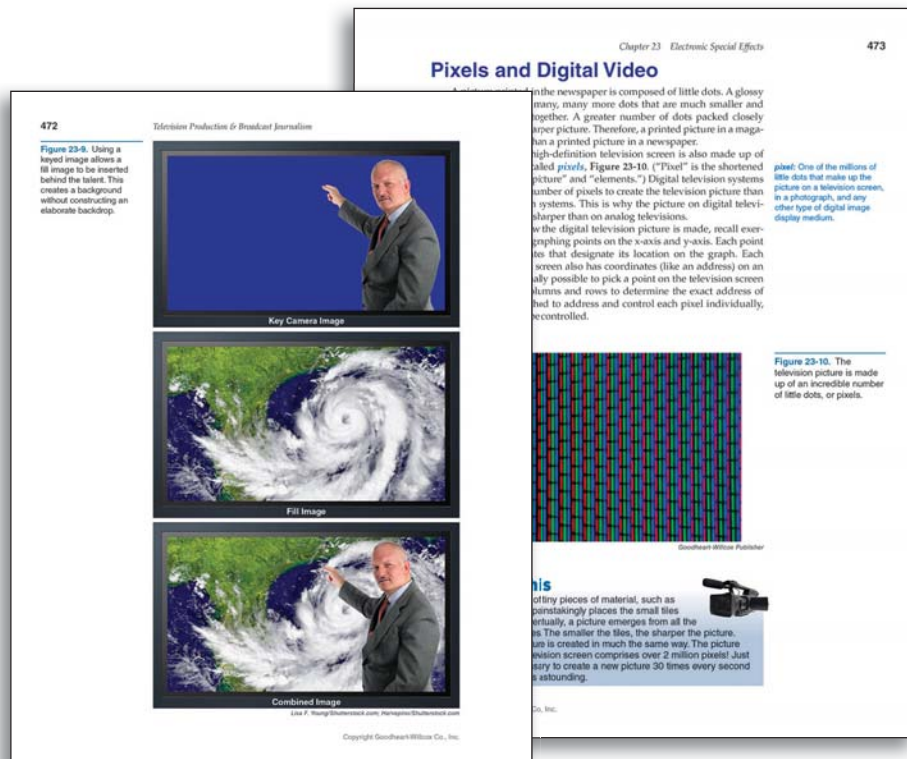
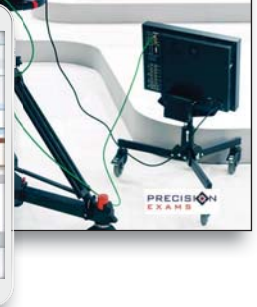
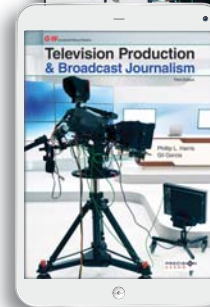
Broadcast journalism coverage includes ethics and news judgment, types of stories, news writing, preparing news packages, and conducting interviews. The broadcast journalism topics address skills and qualities required in the industry, but also incorporate classroom-appropriate standards and practices.

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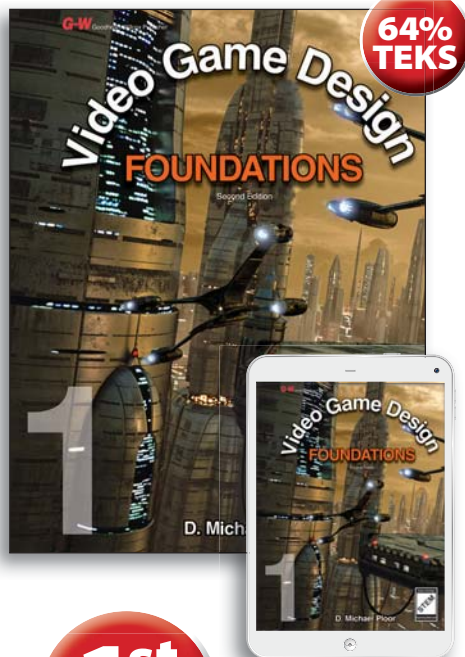
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**Quickly and easily launch
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Video Game Design Foundations

©2014, 2nd Edition

by D. Michael Floor

Video Game Design Foundations provides all of the resources needed for the classroom. Access to easy-to-use game engine software is available with the Software Design Guide (available separately), and a detailed scope and activity sequence chart is included in the teaching package. Aligning with the International Game Developers Association (IGDA) recommended educational framework, lessons provide a top-level overview of the video game design process, from the beginning of the game build to the sales and marketing of the final product. STEM, college and career readiness, and Career and Technical Student Organization event preparation activities are included in every chapter.

- Instructors can quickly and easily establish a video game program within their schools—no previous experience is needed.
- Author teaches video game classes at the high school level and consults with states on course standards.
- Content and game builds are age appropriate.

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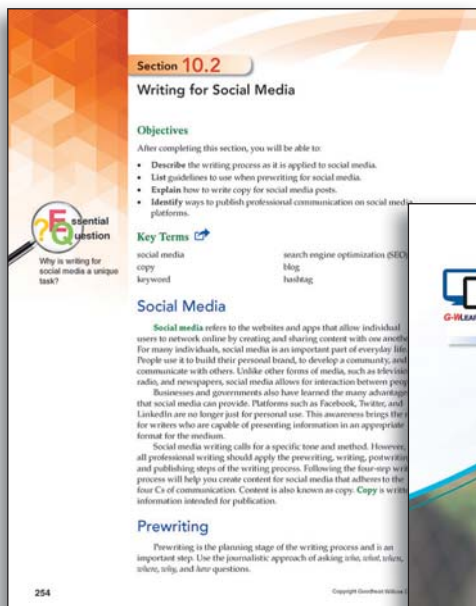
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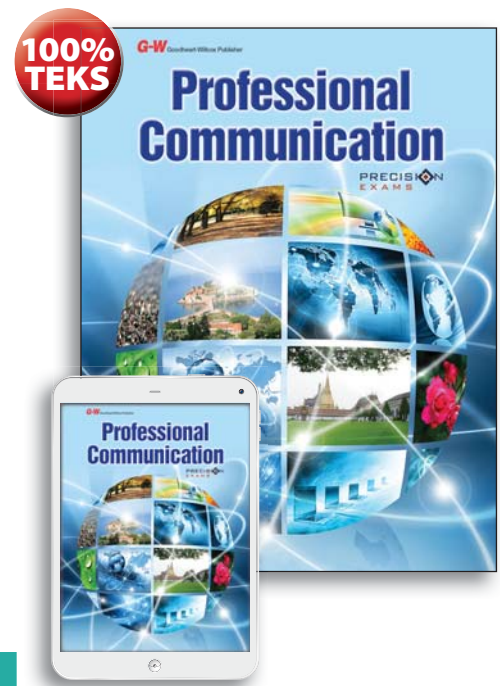
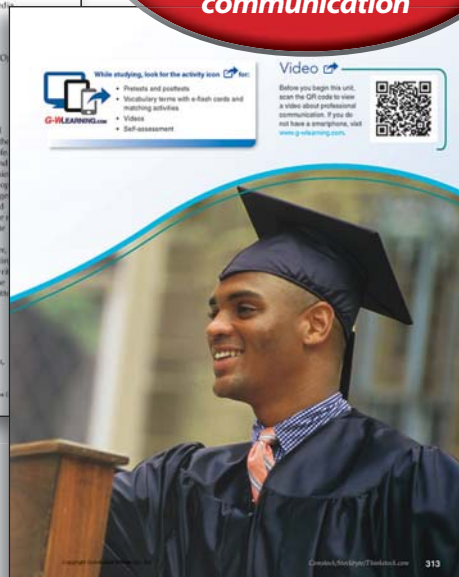
Professional Communication helps meet the challenges of today's digital world, where communication is more important than ever. The basics of writing, speaking, listening, and reading are carefully interwoven into each chapter, enabling the application of English/language arts skills in context. Contemporary topics, such as technical writing and writing for social media, integrate the writing process and digital techniques to develop expertise that is needed for the workplace. Portfolio development activities provide an opportunity to create a personal portfolio to use when applying for college, a community service position, or a job.

- *Communication videos* bring the content to life and illustrate how professional communication skills are used in the real world.
- *Digital citizenship* is explained in detail to prepare students for professional responsibilities in school and in a career.
- *Exploring Communication Careers* examines a wide variety of opportunities in the Arts, A/V Technology, and Communications career cluster.
- *Career Success* unit helps students to prepare, apply, and begin the first day on a job.

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7. Writing Style

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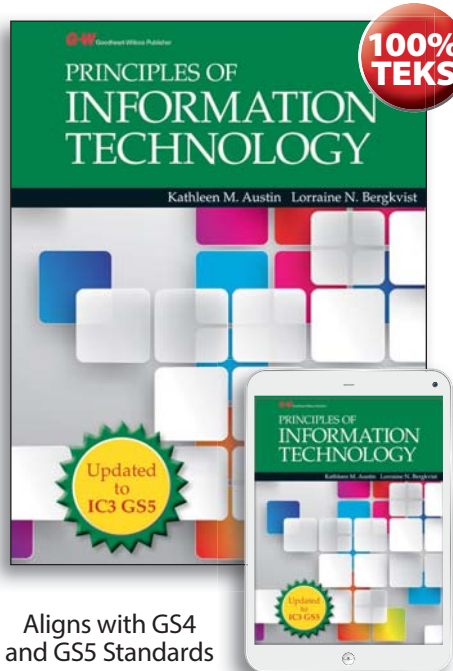
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Principles of Information Technology ©2017

by Kathleen Austin and Lorraine Bergkvist

Principles of Information Technology presents basic principles and concepts about information technology to help students become more valuable employees, better citizens, and knowledgeable consumers. Written specifically for high school students, this text maps to the IC3 Digital Literacy Certification standards. By studying this text, students can prepare for the Certiport IC3 Digital Literacy Certification exams and pursue a well-respected, internationally recognized credential.

- The text is organized into three units to align with the areas of IC3 Digital Literacy Certification—Computing Fundamentals, Key Applications, and Living Online—so that students learn concepts in the context of each certification area.
- IC3 objectives are outlined at the beginning of each chapter and highlighted as they appear within the chapter, helping students focus on certification content.
- *Hands-On Example* activities provide opportunities to apply skills learned in the chapter to prepare students for certification, college, and career.
- Features such as *STEM*, *Green Tech*, *Career Skills*, and *Ethics* offer insights into issues that will be encountered in school, the workplace, and personal life.

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Marketing Dynamics ©2014, 3rd Edition

by Brenda Clark, Cynthia Gendall Basteri, Chris Gassen, and Michelle Walker

Marketing Dynamics provides a well-rounded introduction to the four Ps—product, price, place, and promotion. Other essential topics, such as marketing research and target market identification, are also covered. College and career readiness activities covering writing, speaking, and listening are incorporated. Related activities provide students an opportunity to create a personal portfolio for use when exploring volunteer, education and training, or career opportunities. Career Ready Practices are also included.

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by Brenda Clark and Judy Commers

Entrepreneurship teaches students about the risks and rewards of starting their own businesses. All stages of the process are covered, from idea to growth to exit strategies. Economic concepts are integrated into chapters, and a separate Economics Glossary is included. Two accounting chapters reinforce financial topics. Data files to support the business plan project are available on the companion website. College and career standards for reading, writing, speaking, and listening are incorporated in end-of-chapter activities.

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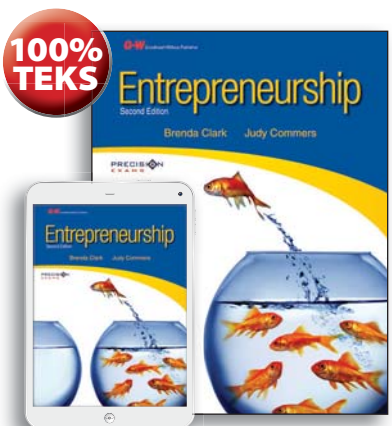
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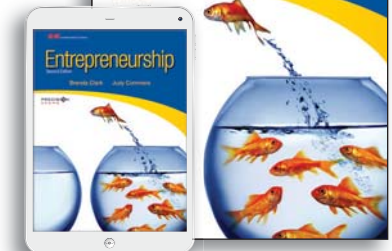


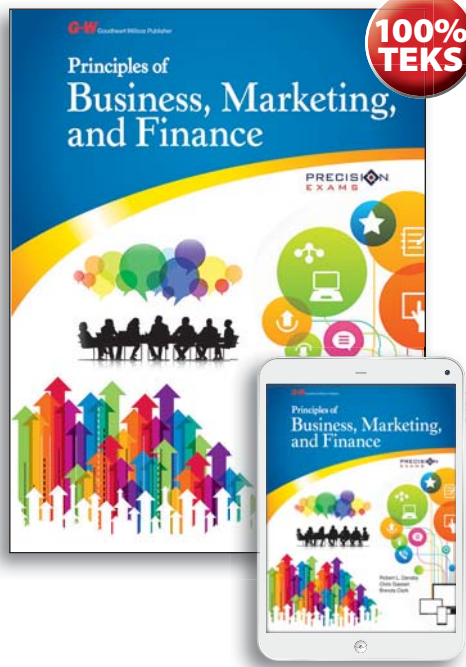
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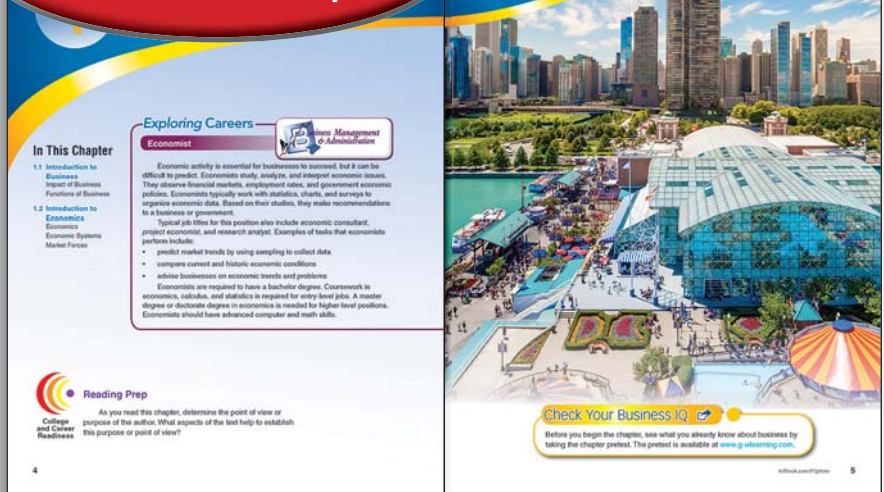
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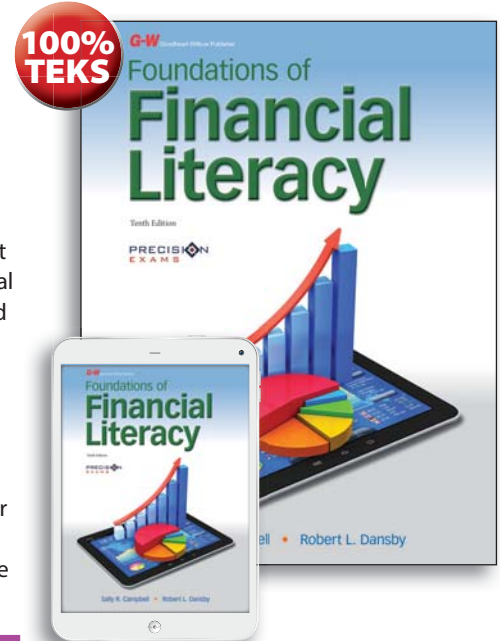
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by Sally R. Campbell and Robert L. Dansby

Foundations of Financial Literacy provides a comprehensive framework for learning about personal financial literacy. By studying this text, students will learn how to make wise financial decisions that will help them lead a productive life and achieve financial security. College and Career Readiness activities for reading, writing, speaking, and listening are included.

- *You Do the Math* activities focus on math skills that are important to understanding personal finance, and a *Math Skills Handbook* provides a quick reference for basic math functions.
- *College and Career Readiness Portfolio* activities provide students an opportunity to create a personal portfolio for use when exploring volunteer, education and training, or career opportunities.
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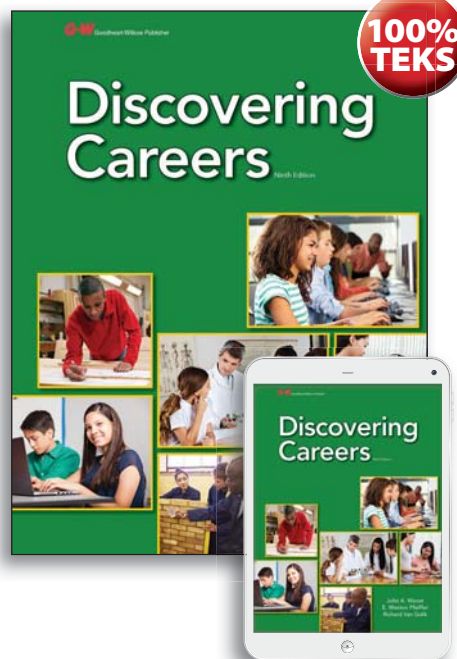
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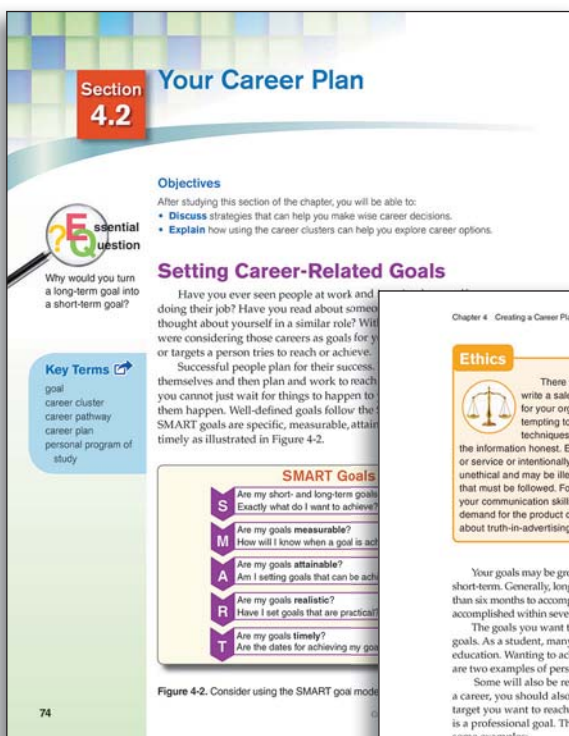
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by John A. Wanat, E. Weston Pfeiffer, and Richard Van Gulik

Discovering Careers introduces career exploration in conjunction with the 16 career clusters. College and career readiness activities covering writing, speaking, and listening are included, as well as Career Ready Practices.

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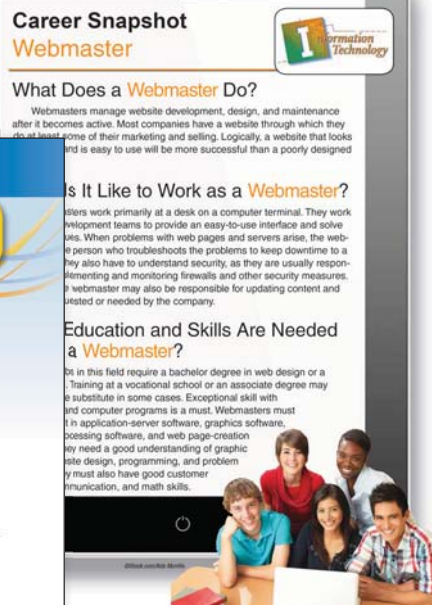
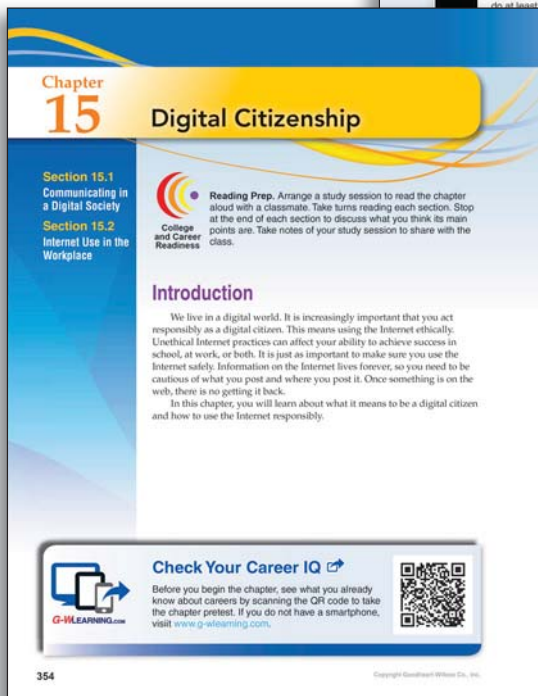
School to Career provides students with a foundation for creating career goals using the 16 career clusters as a guide. College and Career Readiness activities covering writing, speaking, and listening are included, as well as Career Ready Practices.

- A *Lifespan Plan* project-based activity opens each unit to guide students in the creation and evaluation of their own short- and long-term career and life goals.
- *College and Career Readiness Portfolio* activities provide students an opportunity to create personal portfolios for use when exploring volunteer, education and training, or career opportunities.

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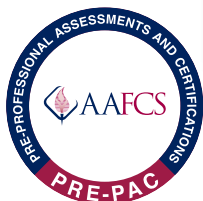
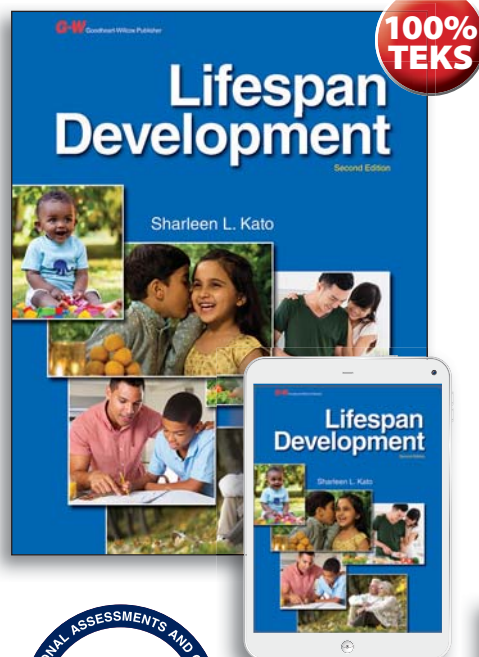
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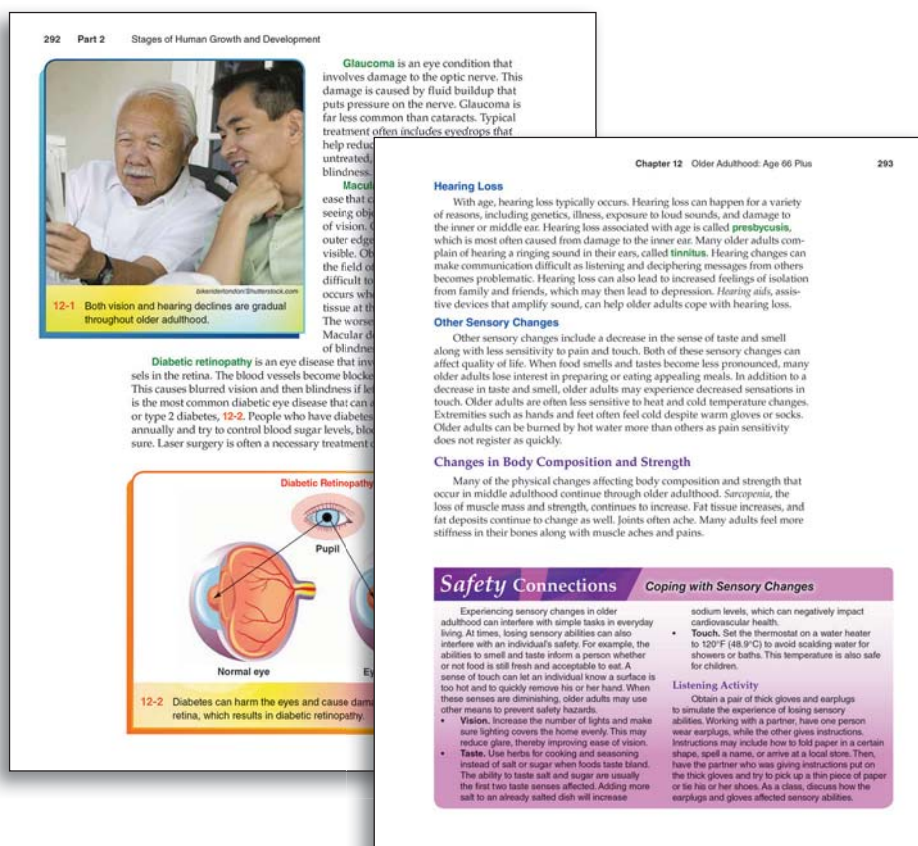
©2018, 2nd Edition

by Sharleen L. Kato

Lifespan Development is the first textbook on this topic to be targeted to the high school student. In it, students learn about the different stages of development that people pass through as they age. From newborn to older adulthood, people continue to develop and change physically, cognitively, socially, and emotionally. Features covering cultural diversity, health, and safety are included throughout the text. Core Skills activities reinforce writing, speaking, math, and career readiness skills.

- The developmental theories of Erikson, Piaget, Vygotsky, and Kohlberg are highlighted.
- A unit is dedicated to career paths in education and training and human services.
- Case studies are included in every chapter to help students relate classroom learning to the real world.

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Teaching helps students, the teachers of tomorrow, explore the world of education. Besides investigating teaching as a profession, students will develop an understanding of the different types of learners they will encounter in the classroom. This includes how humans develop physically, intellectually, emotionally, and socially as all of these impact the instructional methods used. The educational system, both past and present, is reviewed along with the responsibilities that come with employment.

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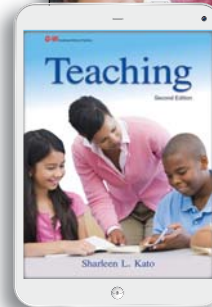
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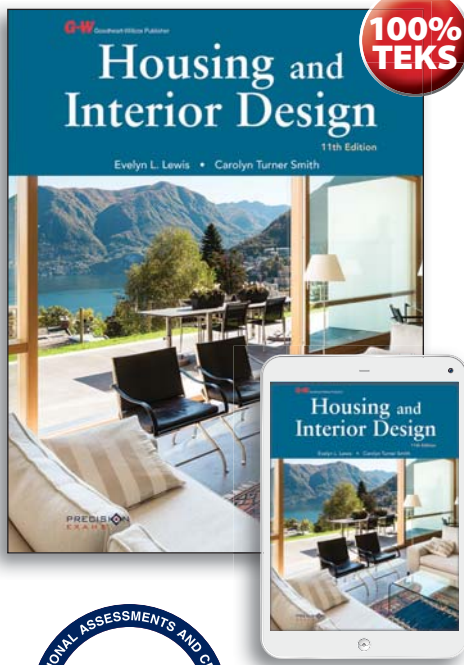
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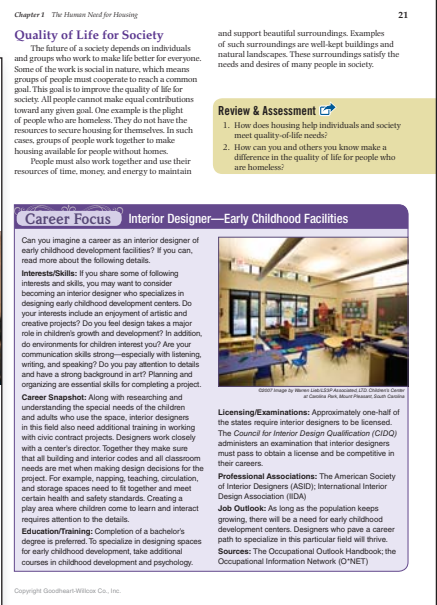
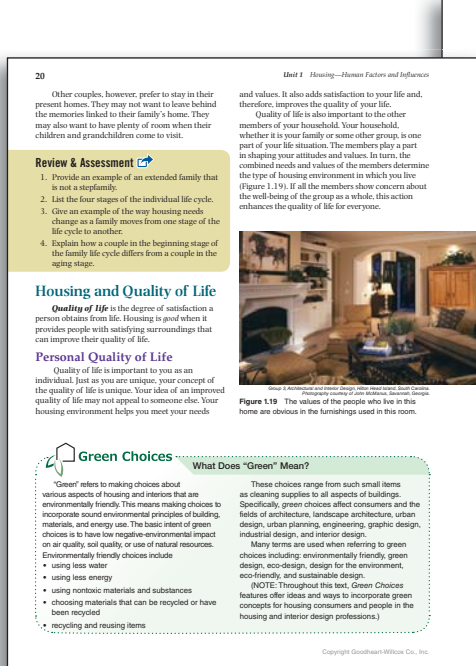
©2018, 11th Edition

by Evelyn L. Lewis and Carolyn Turner Smith

Newly revised and reorganized, **Housing and Interior Design** introduces students to foundational principles and skills characteristic to housing and interiors professions. Geared toward high school students and courses, the text addresses both interior and exterior design and introduces students to the phases of the design process. Concepts include the historical, cultural, governmental, and technological factors that influence housing, along with a discussion of various architectural styles, reading floor plans and architectural documents, and space planning. Students learn about the processes, materials and finishes, construction basics, interior systems, and much more. Green and sustainable design, as well as universal design, are addressed throughout the text.

- The contents emphasize the knowledge and skills students need for housing and interiors careers through the Architecture and Construction and the Arts, A/V Technology, and Communications career clusters and pathways.
- The practical aspects of choosing housing, such as security, health, and safety, as well as costs and maintenance engages students with their real-world application.
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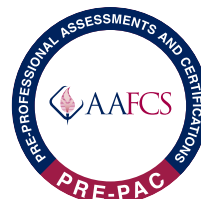
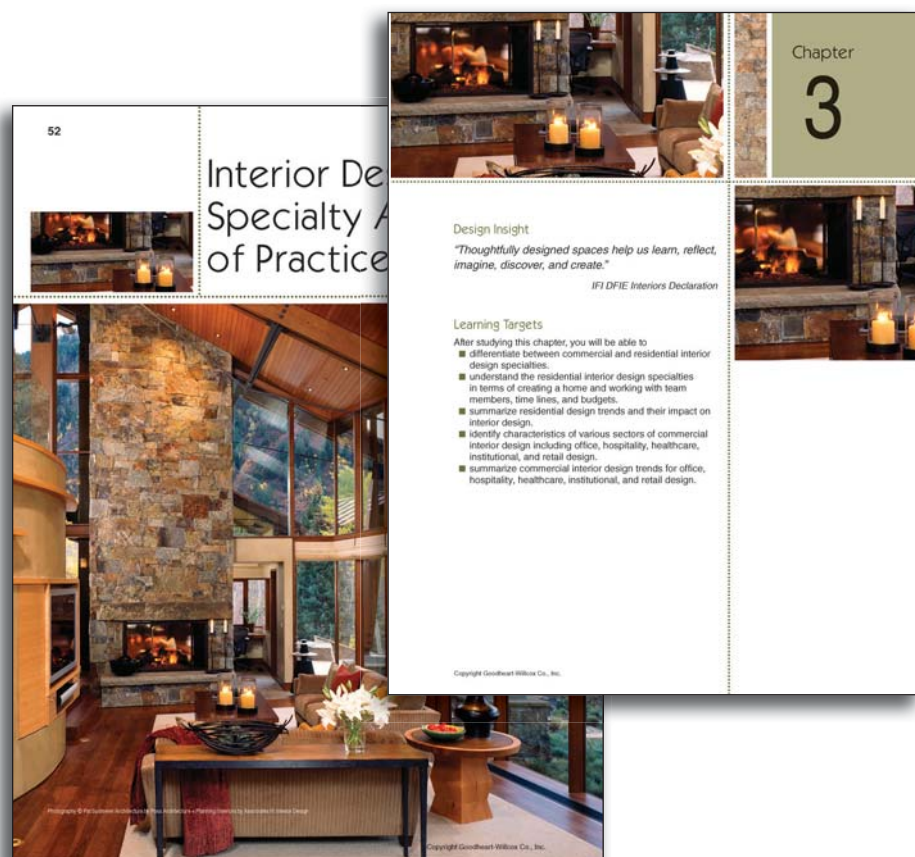
Interior Design ©2017

by Stephanie A. Clemons

Interior Design provides students with an introduction to the history and how-to steps of the profession while expanding into business practices, career specializations, and educational requirements. In combination with the teaching package, students learn about the design process; the importance of color and light; historical influence, such as furniture and architectural styles; and the human element, such as sustainability, aging-in-place, universal design, anthropometrics, proxemics, and ergonomics.

- Students learn the whys and hows of selecting interior materials, furnishings, and accessories.
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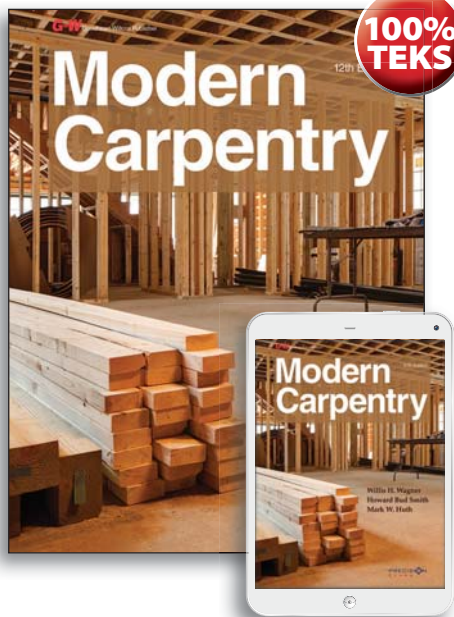
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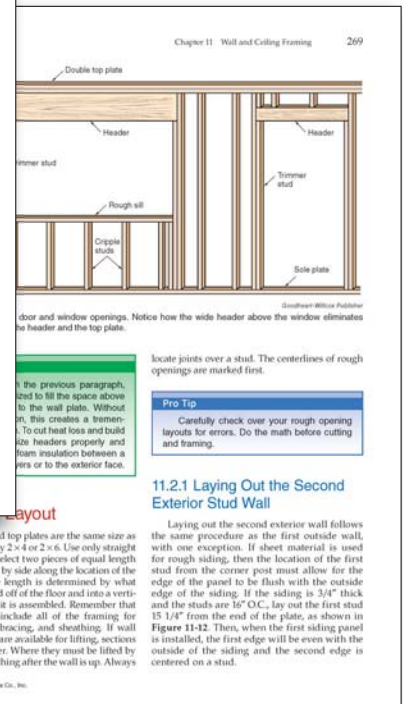
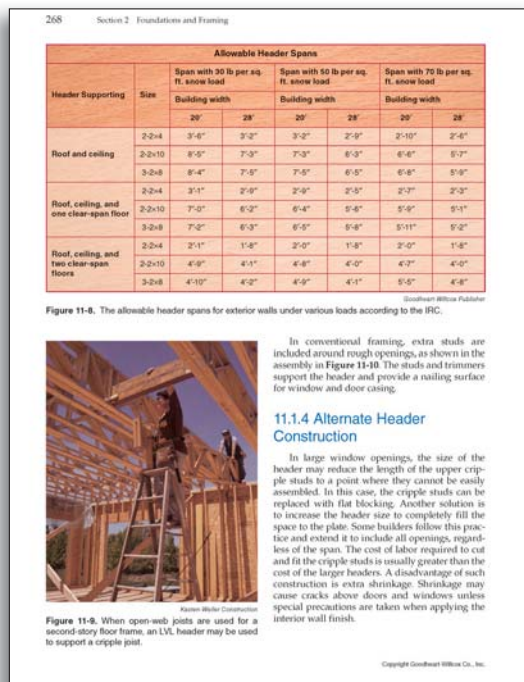
Modern Carpentry ©2016, 12th Edition

by Willis H. Wagner, Howard Bud Smith, and Mark W. Huth

Modern Carpentry provides detailed coverage of all aspects of light construction, including site preparation and layout, foundations, framing and sheathing, roofing, windows and doors, exterior finish, stairs, cabinetry, and finishing. Special topics, such as chimneys, fireplaces, and decks, are also covered. The text familiarizes students with other aspects of the building trades with chapters on plumbing, electrical, and HVACR.

- Online Student Center incorporates video clips, narrated animations, activities, and other digital content to create an engaging and immersive learning experience.
- A career chapter and Construction Careers features throughout the text introduce students to on-the-job success factors, including basic skills, safety, attitudes, and career opportunities.
- Detailed, step-by-step procedures break down complex operations into easy-to-follow tasks, ensuring student success.

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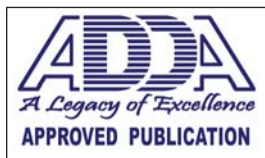
by Clois E. Kicklighter and W. Scott Thomas

Architecture: Residential Drafting and Design provides comprehensive instruction for preparing architectural working drawings using traditional and computer-based methods. The text also serves as a reference for design and construction principles and methods. Its highly effective format organizes content around the design-building process, making the text easy to understand and appealing to students.

Coverage on green building technology, sustainable design, and building information modeling (BIM) complements foundational learning. Each chapter includes objectives, key terms, Internet resources, review questions, and suggested activities for individuals or small groups.

- Step-by-step drafting procedures provide hands-on practice for making drawings using manual drafting and CADD methods.
- New Parametric Modeling features cover methods and techniques for creating a 3D parametric model of a building.
- End-of-chapter activities challenge students to use residential design principles and problem-solving skills.

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CONTENTS

Architectural Drafting Fundamentals

1. Architectural Styles
2. Basic House Designs
3. Preparing for a Career in Architecture
4. Drawing Instruments and Technical Sketching
5. Introduction to Computer-Aided Drafting and Design

Architectural Planning

6. Primary Residential Design Considerations
7. Planning the Living Area
8. Planning the Sleeping Area
9. Planning the Service Area
10. Designing for Health and Safety
11. Designing for Sustainability
12. Building Information Modeling
13. Planning for Remodeling and Renovation

Plan Development

14. Floor Plans
15. Foundation Plans
16. Site Plans
17. Roof Designs

Construction Systems and Supplemental Drawings

18. Footings, Foundations, and Concrete
19. Sill and Floor Construction
20. Wall and Ceiling Construction
21. Doors and Windows
22. Building Sections
23. Elevations
24. Stair Details
25. Fireplace, Chimney, and Stove Details

Presentation Methods

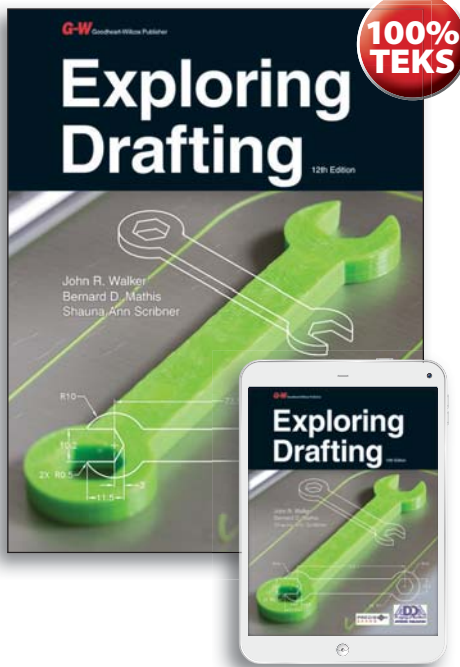
26. Perspective Drawings
27. Presentation Drawings
28. Architectural Models

Electrical, Plumbing, and Climate Control

29. Residential Electrical
30. Electrical Plans
31. Residential Plumbing
32. Plumbing Plans
33. Residential Climate Control
34. Climate Control Plans

Specifications and Estimating Costs

35. Specifications
36. Estimating Building Costs



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Exploring Drafting ©2018, 12th Edition

by John R. Walker, Bernard D. Mathis, and Shauna Ann Scribner

Exploring Drafting is designed for use in introductory courses as it stresses fundamental skills while teaching essential manual and CAD drafting skills. The new edition includes coverage of geometric constructions, orthographic projection, and dimensioning practices. Techniques and procedures used in creating multiview drawings, sectional views, auxiliary views, pictorial views, and pattern developments are taught. STEM and employability content and activities are found throughout the text.

- Content is appropriate for beginning drafting students at any instructional level.
- The end-of-chapter drawing problems help students build problem-solving skills and practice drafting techniques.
- The text follows ASME practices and serves as an ADDA approved publication.

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Conventional drawings are constructed in a step-by-step manner

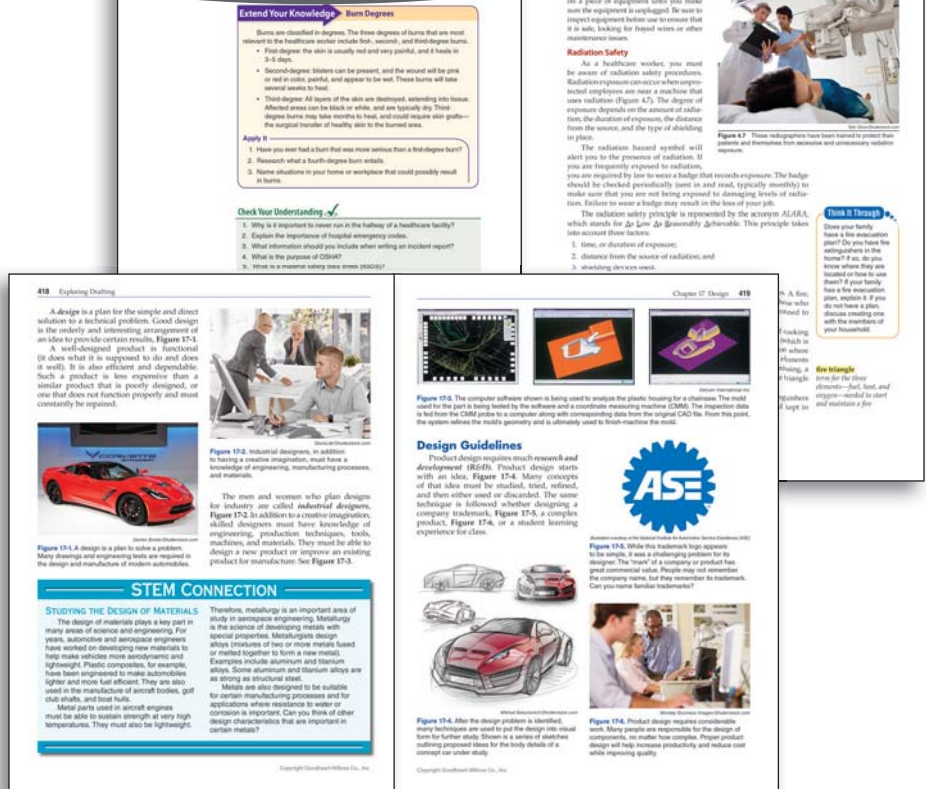


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CONTENTS

1. Why Study Drafting?
2. Careers in Drafting
3. Sketching
4. Drafting Equipment
5. Drafting Techniques
6. Basic Geometric Construction
7. Computer-Aided Drafting and Design
8. Lettering
9. Multiview Drawings
10. Dimensioning
11. Sectional Views
12. Auxiliary Views
13. Pictorials
14. Pattern Development
15. Working Drawings
16. Making Prints
17. Design
18. Models, Mockups, and Prototypes
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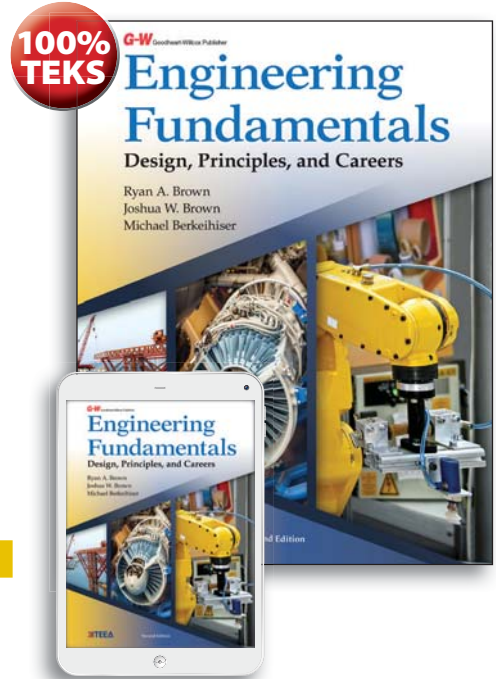
Design, Principles, and Careers ©2018, 2nd Edition

by Ryan A. Brown, Joshua W. Brown, and Michael Berkeihiser

Engineering Fundamentals: Design, Principles, and Careers provides a complete introduction to the field, starting with the design process and then reviewing, in-depth, ten of the top disciplines. For each discipline, career options, educational requirements, basic math and science principles, and real-world applications are presented. The content fully supports STEM initiatives and an activity-based curriculum.

- The text is appropriate for all levels of students as technical content is presented in an easy-to-understand manner.
- Students learn methods to identify problems, brainstorm, and develop solutions.
- New Environmental Engineering chapter includes material on the profession and the principles associated with the discipline.

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CONTENTS

1. What Is Engineering?
2. Engineering as a Profession
3. Engineering Design
4. Defining Problems and Brainstorming
5. Researching Designs
6. Communicating Solutions
7. Modeling, Testing, and Final Outputs
8. Mechanical Engineering
9. Materials Engineering
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Modern Automotive Technology

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by James E. Duffy

Modern Automotive Technology supports career readiness for those wishing to pursue a job in the automotive industry. Organized around the ASE automobile test areas, it details the construction, operation, diagnosis, service, and repair of late-model automobiles and light trucks. Student-focused content is presented using a building-block approach that starts with the fundamental principles of system operation and progresses gradually to complex diagnostic and service procedures. Thorough coverage of the latest developments in the automotive field, including hybrid technology and direct gasoline injection, helps prepare students to service and repair today's complex vehicles. **Modern Automotive Technology** is also a perfect reference for those preparing for the ASE automobile certification tests.

- Organized around the ASE automobile test areas and correlated to the 2013 NATEF Task List (MLR, AST, and MAST).
- Short sentences, concise definitions, and thousands of color images help students learn quickly and easily.
- Strong emphasis on electricity and electronics provides students with a thorough understanding of this key topic.

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CONTENTS

Introduction to Automotive Technology

1. The Automobile
2. Automotive Careers and ASE Certification
3. Basic Hand Tools
4. Power Tools and Equipment
5. Auto Shop Safety
6. Automotive Measurement and Math
7. Service Information and Work Orders
8. Fasteners, Gaskets, Seals, and Sealants
9. Vehicle Maintenance, Fluid Service, and Recycling
10. Career Success

Engine Technology

11. Engine Fundamentals
12. Engine Design Classifications
13. Engine Top End Construction
14. Engine Bottom End Construction
15. Engine Front End Construction
16. Engine Size and Performance Measurements

Fundamentals of Electricity and Electronics

17. Electrical Principles
18. Circuit Types and Ohm's Law
19. Electric and Electronic Components
20. Electrical Tools and Test Equipment
21. Wiring Diagrams and Wiring Repairs
22. Basic Electrical Tests

Computer Control Technology

23. Computer System Fundamentals
24. On-Board Diagnostics and Scan Tools
25. Computer System Service

Electrical and Electronic Systems Technology

26. Hybrid Drive Technology
27. Hybrid Drive Systems Diagnosis and Repair
28. 12-Volt and HV Battery Technology
29. 12-Volt and HV Battery Service
30. Engine Starting Systems
31. Starting System Diagnosis, Testing, and Repair
32. Charging System Technology
33. Charging System Diagnosis, Testing, and Repair
34. Ignition System Technology
35. Ignition System Diagnosis, Testing, and Repair

36. Lights, Instrumentation, Wipers, and Horns—Operation and Service
37. Sound Systems and Power Accessories
38. Security and Navigation Systems

Fuel, Exhaust, and Induction System Technology

39. Automotive Fuels, Combustion Efficiency
40. Fuel Tanks, Pumps, Lines, and Filters
41. Gasoline Injection Fundamentals
42. Gasoline Injection Diagnosis and Repair
43. Diesel Injection Fundamentals
44. Diesel Injection Diagnosis, Service, and Repair
45. Exhaust System Technology and Repair
46. Turbochargers and Superchargers—Construction, Operation, and Repair

Cooling and Lubrication Systems Technology

47. Cooling System Technology
48. Cooling System Testing, Maintenance, and Repair
49. Lubrication System Fundamentals
50. Lubrication System Diagnosis, Testing, and Repair

Emission Control System Technology

51. Emission Control System Technology
52. Emission Control System Testing, Service, and Repair

Engine Troubleshooting and Performance

53. Engine Performance and Driveability
54. Advanced Diagnostics

Engine Service and Repair

55. Engine Mechanical Problems
56. Engine Removal, Disassembly, and Cleaning
57. Short Block Rebuilding and Machining
58. Engine Top End Rebuilding
59. Front End Service
60. Engine Reassembly, Installation, and Break-In

Drive Train and Axle Technology

61. Clutch Technology
62. Clutch Diagnosis, Service, and Repair
63. Manual Transmission Technology
64. Manual Transmission Diagnosis, Service, and Repair

65. Automatic Transmission Technology
66. Automatic Transmission Diagnosis, Service, and Repair
67. Drive Shaft and Transfer Case Technology
68. Drive Shaft and Transfer Case Diagnosis, Service, and Repair
69. Differential and Rear Drive Axle Technology
70. Differential and Rear Drive Axle Diagnosis, Service, and Repair
71. Transaxle and Front Drive Axle Technology
72. Transaxle and Front Drive Axle Diagnosis and Repair

Suspension and Steering Technology

73. Tire, Wheel, and Wheel Bearing Fundamentals
74. Tire, Wheel, and Wheel Bearing Diagnosis, Service, and Repair
75. Suspension System Technology
76. Suspension System Diagnosis and Repair
77. Steering System Technology
78. Steering System Diagnosis and Repair
79. Wheel Alignment

Brake System Technology

80. Brake System Technology
81. Brake System Diagnosis, Service, and Repair
82. Anti-Lock Brakes, Traction Control, and Stability Control

Heating and Air Conditioning Technology

83. Heating and Air Conditioning Fundamentals
84. Heating and Air Conditioning Diagnosis, Service, and Repair

Safety Systems and Future Technologies

85. Restraint System Technology
86. Restraint System Service
87. New and Future Technology

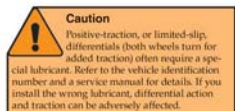
The student-friendly format—with color photos, illustrations, and Tech Tips—allows aspiring technicians to learn quickly and easily.

Video Library included



144 Section 1 Introduction to Automotive Technology

At the manufacturer's recommended change interval, remove the drain plug. It will be on the bottom of the differential. After draining, reinstall the plug and fill the differential with the proper lubricant. If a drain plug is not provided, a special siphon (suction) gun can be used to draw out the old fluid.

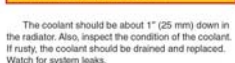


Checking Engine Coolant

Engine coolant (mixture of water and antifreeze) is used in an engine's cooling system. Engine coolant must be changed periodically. After prolonged use, the coolant will deteriorate. It can become very corrosive and filled with rust. This may result in premature water pump, thermostat, and radiator failure.

To check the coolant level, look at the side of the plastic overflow tank connected to the radiator. The coolant should be between the hot and cold marks on the side of the tank. See Figure 9-12.

When an overflow tank is used, the radiator cap does not need to be removed to check coolant level. However, some older cars do not use an overflow tank. In this case, the radiator cap must be removed to check the coolant level.



The coolant should be about 1" (25 mm) down in the radiator. Also, inspect the condition of the coolant. If rusty, the coolant should be drained and replaced. Watch for system leaks.



A—Plastic Reservoir Tank



B—Clean Funnel

Figure 9-12. Do not remove the pressure cap when checking modern engine cooling systems. Only remove the non-pressurized plastic reservoir cap.

Checking Power Steering Fluid

Power steering fluid level should be checked regularly. The engine should not be running when checking power steering fluid. If the fluid is contained in a clear plastic reservoir, simply compare the fluid level to the markings on the side of the reservoir. See Figure 9-13A. In some vehicles, the level is checked by removing a dipstick from the power steering pump. Figure 9-13B. Inspect the fluid level on the dipstick closely. If low, inspect for and correct any leaks. Then add the correct type and amount of power steering fluid.

Burned power steering fluid has been overheated from pump wear or a clogged line or passage in the hydraulic system. It will smell like burned rubber. The old fluid must be flushed and replaced.

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Tech Tip

A common and troublesome mistake is accidentally overfilling the power steering system. If you add too much power steering fluid and fill the reservoir to the very top, the extra fluid will spray out all over the engine compartment. Remember that liquids cannot be compressed. If you overfill the reservoir, use a clean squeeze bulb to suck out the extra fluid.



A



B

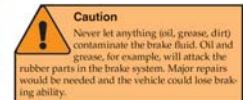
Figure 9-13. Note how to check the power steering fluid level. A—Compare fluid level markings on the side of the reservoir. B—On some vehicles, the power steering pump has a cap with a dipstick. Check the fluid with the engine off. Compare the fluid level to markings on the dipstick. Normally, you need to add only a fraction of a quart, not a whole quart.

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Chapter 9 Vehicle Maintenance, Fluid Service, and Recycling 145

Checking Brake Fluid

The amount of brake fluid in a master cylinder should be inspected at least twice a year. Look at Figure 9-14. The master cylinder is normally mounted on the firewall (body section between the engine and the passenger compartment). When the master cylinder reservoir is clear plastic, simply compare the fluid level to the markings on the reservoir. The fluid should be between the ADD and FULL marks. With some master cylinders, you must remove the reservoir cover to check the fluid. Generally, the fluid should be about 1/4" (about 6 mm) down from the top of the reservoir. Add the recommended type of brake fluid as needed.



Checking Hydraulic Clutch Fluid

Some manual transmission clutches do not use mechanical linkage rods or cables. Instead, they use



Figure 9-14. Check the brake fluid level at the master cylinder reservoir. The master cylinder is mounted on the firewall, in front of the driver. The maximum fluid level is often indicated on the side of the reservoir. If not, fluid should be slightly below the top of the reservoir.

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404 Section 4 Computer Control Technology

Tech Tip

Late-model vehicles are equipped with CAN-compliant computer systems. While the diagnostic techniques for these systems are similar to those for conventional computer systems, a CAN-compliant scan tool must be used to retrieve diagnostic information from CAN-equipped vehicles.

Data Link Connector (Diagnostic Connector)

The data link connector (DLC) is a standardized multipin terminal used to link the scan tool to the computer. In the past, this connector was identified by a variety of names, including diagnostic connector and assembly line diagnostic link (ALDL).

OBD I data link connectors came in various shapes and sizes, and were equipped with a varying number of pins or terminals. With OBD II, the DLC is a standardized 16-pin connector. The female half of the connector is on the vehicle, and the male half is on the scan tool cable.

With OBD II diagnostic systems, you should be able to connect a scan tool to the vehicle's data link connector with one hand while sitting in the driver's seat or kneeling outside the vehicle.

Connecting the Scan Tool

In late-model vehicles, the data link connector is mounted under the dash in a location that is easy to access from the driver's seat. A scan tool cable

should slide easily into the data link connector. Figure 24-5. If not, something is wrong. Never force the two together or you could damage the pins on the tool cable or the data link connector. With an older vehicle, you will need an adapter so the scan tool connector will fit the vehicle's pre-OBD II pin configurations.

Using Scan Tools

Modern scan tools will give prompts, or step-by-step instructions, in their display windows. The prompts tell you how to input specific vehicle information and run diagnostic tests. These procedures and specifications are programmed into the scan tool circuitry. See Figures 24-6 and 24-7.



Figure 24-6. This advanced scan tool is prompting the user to install an OBD II connector and a specific key adapter.



Figure 24-5. The OBD II test connector is under the dash. It should be visible as you lean down and look under the dash. A—The OBD II connector has 16 male pins and a power plug to the power scan tool. B—The OBD II connector under the dash has a 16-pin female plug. C—Slide scan tool connector straight into the vehicle data link connector so the pins slide smoothly together.

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Chapter 24 On-Board Diagnostics and Scan Tools 405



Controls vary by manufacturer.



This scan tool uses simple yes-no buttons.

Figure 24-7. Always read the operating manual fully before attempting to use any model of scan tool. A—Scan tool controls vary from one manufacturer to another. B—Note the simple yes-no buttons that allow the user to quickly respond to the scan tool's prompts.

The scan tool may ask you to input VIN information (numbers or letters) from the plate on the top of the dash. The VIN data lets the scan tool know which engine, transmission, and options are installed on that car or truck. With some makes, however, the on-board computer will contain this data and will automatically download it into the scan tool. Then, you will be able to select the information that you would like the scan tool to give you. Figure 24-8.

Some of the information a scan tool can request includes:

- Stored diagnostic trouble codes—This is a number that represents the general area (body, chassis, power train, network) and specific system or part that is not functioning normally in the vehicle.

- Fault description—This explains what each stored diagnostic trouble code means by pinpointing specific fuel injectors, ignition coils, sensors, actuators, or other parts and circuits that are operating out of specification.
- Datastream information—This displays the operating values of all monitored circuits and sensors (engine speed, engine temperature, ignition timing, injector pulse width, and other values).
- Run tests—These read datastream circuit values for sensors and actuators while they are operating. If an actuator fails to move or fire during the run tests, the scan tool will inform you of any problem.



A



B

C

Figure 24-8. A full-feature scan tool can perform complex testing and troubleshooting procedures. A—This advanced scan tool does not require cartridges. You can quickly navigate to the exact make, model, and year car to be tested. B—Here the scan tool is asking the technician to input VIN information. This lets the tool know how the vehicle is equipped—engine type, transmission type, computer configuration, etc. C—You can then proceed to read stored trouble codes, or erase codes by scrolling through the menu.

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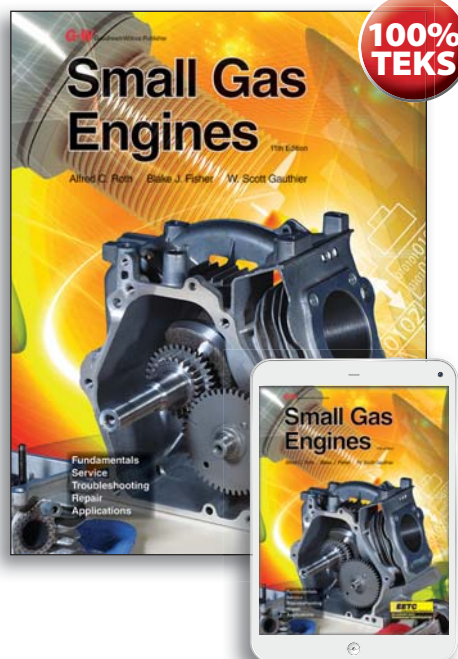
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Small Gas Engines ^{©2017, 11th Edition}

by Alfred C. Roth, Blake J. Fisher, and W. Scott Gauthier

Small Gas Engines presents detailed information regarding construction, operation, troubleshooting, service, rebuilding, and repair. It is focused on single- and multi-cylinder, two- and four-cycle gasoline engines. The text is appropriate for all levels, as technical information is explained in a user-friendly manner. An appendix lists useful specifications and measurement conversions.

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4. Fundamentals of Electricity, Magnetism, and Electronics

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5. Principles of Engine Operation, Two- and Four-Stroke Engines
6. Engine Components
7. Measuring Engine Performance

Engine Systems

8. Fuel Supply, Air Induction, and Emissions
9. Carburetion and Fuel Injection
10. Ignition Systems
11. Lubrication Systems
12. Cooling Systems

Engine Service

13. Preventive Maintenance and Troubleshooting
14. Fuel System Service
15. Ignition and Electrical System Service
16. Engine Disassembly and Inspection
17. Cylinder, Crankshaft, and Piston Service
18. Camshaft and Valve Train Service
19. Engine Reassembly and Break-In

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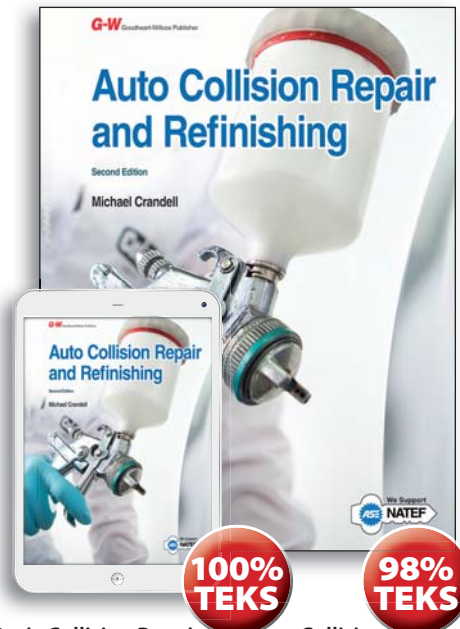
Auto Collision Repair and Refinishing

by Michael Crandell

Auto Collision Repair and Refinishing, written by an ASE-Certified Master Collision Repair Technician, details the latest techniques in the field, in addition to traditional procedures. Content is organized around ASE's Collision Repair & Refinish Certification Tests (B Series) in order to provide students and experienced technicians an exam preparation tool. This comprehensive textbook includes an extensive chapter on estimating, providing instruction on this critical task. It also details repair techniques for mechanical systems, such as brake systems and cooling systems.

- The text correlates to the 2013 NATEF Collision Repair Task List.
- The 2017 edition includes a new fasteners chapter, as well as expanded information on aluminum repair and waterborne paints.
- A chapter on employment provides students with the guidance they need to find and keep a position within the repair industry.

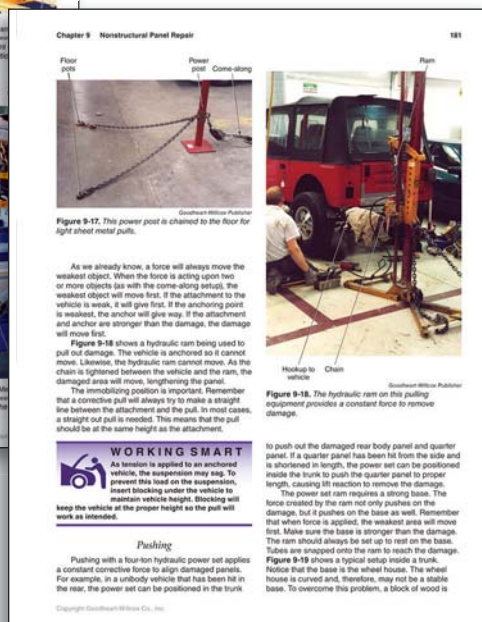
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CONTENTS

Introduction to Collision Repair

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2. Safety
3. Vehicle Construction
4. Fundamentals of Collision Damage
5. General Purpose Tools and Equipment, Service Information
6. Fasteners
7. Welding and Cutting

Nonstructural Repairs

8. Nonstructural Repair Tools, Equipment, and Materials
9. Nonstructural Panel Repair
10. Bolted Nonstructural Part Replacement
11. Welded and Bonded Nonstructural Panel Replacement
12. Plastic Repair
13. Glass

Structural Repairs

14. Unibody/Frame Straightening Equipment
15. Measurements
16. Unibody Straightening
17. Full-Frame Repair
18. Structural Component Replacement

Mechanical and Electrical Repairs

19. Steering and Suspension
20. Electrical System
21. Brakes
22. Cooling, Heating, and Air Conditioning Systems
23. Power Train
24. Restraint Systems

Refinishing

25. Refinishing Tools and Equipment
26. Refinish Materials
27. Paint Mixing and Reducing
28. Spray Technique
29. Surface Preparation
30. Color Matching
31. Paint Application
32. Specialty Painting
33. Detailing

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35. ASE Certification
36. Employment Strategies and Employability Skills

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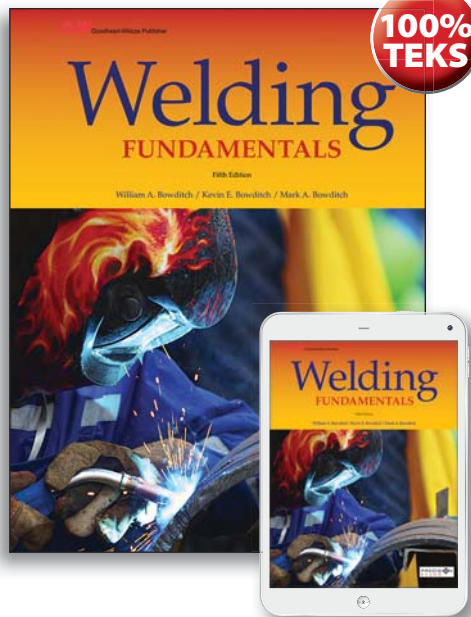
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Welding Fundamentals ©2017, 5th Edition

by William A. Bowditch, Kevin E. Bowditch, and Mark A. Bowditch

Welding Fundamentals is designed to provide students with a strong understanding of the underlying theory and skills required for successful welding, with a strong emphasis on safety. It provides all of the information needed to help students develop proficiency with the most common welding processes (including GTAW, GMAW, FCAW, SMAW, and oxyfuel welding), thermal cutting, basic print reading and weld symbology, and joint design and fit up. The text also introduces students to weld inspection and testing.

- Covers all of the key indicators for AWS SENSE Level-1 certification, so the book can be used in all courses leading to SENSE Level-1 certification.
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CONTENTS

- | | |
|---|---|
| 1. Careers in Welding | 20. GTAW: Equipment |
| 2. Safety in the Welding Shop | 21. GTAW: Flat Welding Position |
| 3. Welding and Cutting Processes | 22. GTAW: Horizontal, Vertical, and Overhead |
| 4. The Physics of Welding | 23. Plasma Arc Cutting |
| 5. Math for Welding | 24. Oxyfuel Gas Cutting and Welding: Equipment and Supplies |
| 6. Math Applications for Welders | 25. Oxyfuel Gas Cutting and Welding: Equipment |
| 7. Weld Joints and Positions | 26. Assembly and Adjustment |
| 8. Welding Symbols | 27. Oxyfuel Gas Cutting |
| 9. SMAW: Equipment and Supplies | 28. Oxyfuel Gas Welding: Flat Welding Position |
| 10. SMAW: Equipment | 29. Oxyfuel Gas Welding: Horizontal, Vertical, and Overhead Welding Positions |
| 11. SMAW: Electrodes | 30. Assembly and Adjustment |
| 12. SMAW: Flat Welding Position | 31. Oxyfuel Gas Cutting |
| 13. SMAW: Horizontal, Vertical, and Overhead Welding Positions | 32. Oxyfuel Gas Welding: Horizontal, Vertical, and Overhead Welding Positions |
| 14. Surfacing | 33. Resistance Welding: Equipment and Supplies |
| 15. GMAW and FCAW: Equipment and Supplies | 34. Resistance Welding: Procedures |
| 16. GMAW and FCAW: Equipment Assembly and Adjustment | 35. Welding Pipe and Tube |
| 17. GMAW and FCAW: Flat Welding Position | 36. Special Welding and Cutting Processes |
| 18. GMAW and FCAW: Horizontal, Vertical, and Overhead Welding Positions | 37. Robotics in Welding |
| 19. GTAW: Equipment and Supplies | 38. Inspecting and Testing Welds |
| | 39. Welder Certification |

Section 3 Gas Metal and Flux Cored Arc Welding

Welding in the Vertical Welding Position

Vertical position welding can be done traveling up (called *uphill welding*) or down (called *downhill welding*). The forehand welding method is used when welding uphill. The backhand method is used when welding downhill. When traveling up or down, the gun is usually pointed up. Vertical downhill welding is done on thin material less than 3/16" (4.8 mm). It has a faster travel speed, but less penetration. Vertical uphill welding is done on material 3/16" (4.8 mm) or greater.

When welding in the vertical position, do not allow the weld pool to become too large. Proper gun angle and control of the weld pool size will help prevent the pool from sagging.

The electrode is directed toward the root of the weld when welding in the vertical position. The electrode should be centered over the root of the weld. This heats both pieces of metal equally. A side-to-side weaving motion is used to obtain a wider weld bead. Hesitate at the edges of the weld to prevent undercutting when using a weaving motion. The gun angles used to make a vertical weld are the same as those used for flat welding. Gun angles for fillet and butt welds are discussed in Chapter 17.

Fillet Welding

A C-shaped weld pool is used when making a fillet weld. This indicates that both surfaces are melting. If one plate is thicker than the other, the electrode may have to be directed more toward the thicker plate. When welding a lap joint, the electrode may need to be pointed more toward the surface than the edge.

A fillet weld made in the vertical welding position should appear similar to and have the same strength as a weld made in the flat welding position. However, more skill is required to make the vertical weld. Figure 18-8 shows two fillet welds being made in the vertical position.

More than one weld pass or weld bead may be required to complete a weld. The weld is cleaned after making each weld pass. Remove all slag from the weld and wire-brush the weld. The second pass requires a slightly different angle of the gun. The travel angle remains the same (20°–25°), but the gun

is pointed between the first pass and the base metal. A third pass requires the same angle but in the opposite direction. See Figure 18-9. Each pass must melt the base metal and the previous pass. Another option is to add a weave bead. Figure 18-10 shows a vertical down T-joint made with FCAW-B and a weave bead.

Exercise 18-3

Making a Fillet Weld on a Lap Joint in the Vertical Welding Position

1. Obtain two pieces of mild steel measuring 1/8"–3/16" × 4–6" × 6–8" (3 mm × 10 mm × 15 mm).
2. Clean and bevel the edges.
3. Set the flow rate.
4. Clamp the work.
5. Tack weld the joint in the vertical position.
6. Place the welding torch.
7. Make a vertical weld.
8. Maintain the lower position.
9. Weld the joint.

Inspection

The weld convex or concave should be checked.

Additions

This exercise can be done with GMAW and FCAW.

Build strong skills
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Chapter 18 GMAW: Horizontal, Vertical, and Overhead Welding Positions 269



Figure 18-8 A—A fillet weld being made on a vertical lap joint. This weld is being made uphill using the forehand welding method. B—A fillet weld being made on a vertical T-joint. The weld is being made uphill using the forehand welding method.

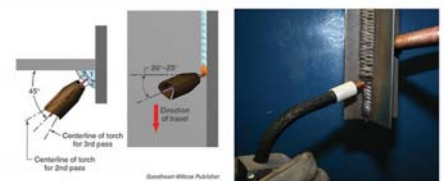


Figure 18-9 The suggested gun angles for welding a multiple-pass fillet weld on a T-joint in the vertical position. Notice that the work angle must change slightly from 45° for the second and third passes.



Figure 18-10 Self-shielded FCAW is being used to weld vertically down. The weld is being made uphill using the forehand method. The 20° drag angle is being used.

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Index

A

Agricultural Mechanics and
 Technology Systems 15
 Apparel: Design, Textiles & Construction... 17
 Architecture: Residential Drafting
 and Design 33
 Auto Collision Repair and Refinishing..... 39

C

Certification Prep Series..... 22
 Child Development: Early Stages
 Through Age 12 6
 Culinary Professional, The 10

D

Discovering Careers 26

E

Engineering Fundamentals..... 35
 Entrepreneurship 23
 Exploring Drafting 34

F

Foundations of Financial Literacy 7, 25

G

Guide to Good Food 9

H

Health Science: Concepts
 and Applications 2
 Horticulture Today 14
 Hospitality Services 11
 Housing and Interior Design..... 30

I

Interior Design 31
 Interpersonal Relationships 8
 Introduction to Anatomy
 and Physiology..... 4
 Introduction to Health Science: Pathways
 to Your Future 1
 Introduction to Medical Terminology..... 3

L

Lifespan Development 28

M

Marketing Dynamics..... 23
 Modern Automotive Technology 36–37
 Modern Carpentry 32

P

Photography: Portfolio to Profession 18
 Principles of Agriculture, Food, and
 Natural Resources 13
 Principles of Business, Marketing,
 and Finance 24
 Principles of Floral Design:
 An Illustrated Guide 16
 Principles of Food Science 12
 Principles of Human Services 5
 Principles of Information Technology 22
 Professional Communication 21

S

School to Career 27
 Small Gas Engines 38

T

Teaching 29
 Television Production &
 Broadcast Journalism 19

V

Video Game Design Foundations 20

W

Welding Fundamentals 40
 Working with Young Children 7



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