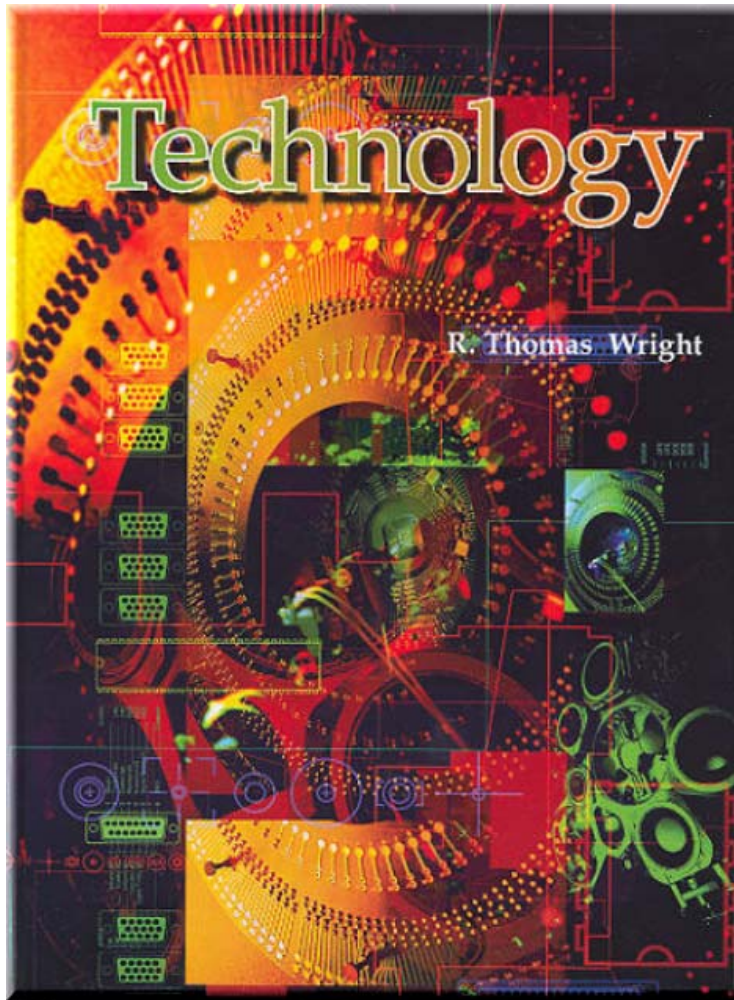


Maryland Technology Education Voluntary State Curriculum Correlation



Technology

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Created for Public School Systems



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Product Description

Textbook

Textbooks from G-W are accurate and thorough, providing the most up-to-date information for you students' success. Numerous illustrations selected for their instructional value are used throughout; where appropriate, artwork is color-coded to enhance understanding of processes or systems. Textbooks include clearly defined technical terms, a strong emphasis on safety, special graphic treatments to set off special features such as systematic procedures, review questions, and a variety of activities to reinforce learning.

Student Activity Manual

Are organized to follow the textbook on a chapter-by-chapter basis, providing questions to help the student review the material presented in the chapter.

Teacher's Wraparound Edition

Provide a variety of instructional support elements in the margins of each page to guide you in reviewing and reinforcing the chapter content. Related Web sites are often cited along with technology applications and cross-curricular ideas. Wraparound editions also provide correlations to national or industry standards, suggested course organizations, and strategies for implementing the student text.

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Provide you with numerous instructional resources that support each chapter of the textbook. These may include suggested teaching strategies, test masters, answer keys, introductory activities, reproducible masters, and additional resources. All resources for each chapter are conveniently grouped together.

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Provide you with all the instructional information from the Teacher's Manual, plus color transparencies, all in a convenient three-ring binder. G-W Binders have handles and Velcro™ closures making them easy to carry to the classroom, lab, or home.

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Provide you with all the instructional resources included in the Teacher's Manual and Teacher's Resource Portfolio, along with Examview Test Generator Software. The content, organized by chapter, includes suggested teaching strategies, correlation charts, test masters, answer keys, introductory activities, black/white and color reproducible masters, lists of additional resources, and related Web sites. The Examview Test Generator Software allows you to quickly and easily create tests from a test bank of hundreds of questions relating to the content in the student textbook. Examview gives you the ability to edit existing questions or add new questions to the test bank, print multiple versions of the same test, prepare LAN-based online tests, and upload test to WebCT and Blackboard.

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Help you teach and visually reinforce the key concepts from each chapter in the text by presenting thousands of illustrations with text content. The purchase of a Goodheart-Willcox site license permits you to install or make multiple copies of the specific site-licensed software for use on an unlimited number of computers at a single building or campus address of a teaching/educational institution.

Product Information

| Item | ISBN | School Price* |
|---|---|---------------|
| Textbook | 978-1-59070-718-0 | \$44.25 |
| Student Activity Manual | 978-1-59070-720-3 | \$9.99 |
| Teacher's Wraparound Edition | 978-1-59070-719-7 | \$56.85 |
| Teacher's Manual | 978-1-59070-721-0 | \$49.50 |
| Teacher's Resource Binder | 978-1-59070-722-7 | \$102.00 |
| Teacher's Resource CD | 978-1-59070-723-4 | \$159.00 |
| PowerPoint Presentations CD Individual License | 978-1-59070-805-7 | \$150.00 |
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| Free Student/Teacher Companion Web site | http://www.g-wlearning.com/technologyeducation | |

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***Organization of the Technology Education Voluntary State Curriculum**

Overarching Standards: These are broad statements on what students should know and be able to do. This document has five overarching standards.

Indicators: Each of the overarching standards has several indicators, which are more specific statements on what students should know and be able to do.

Objectives: Each indicator has several objectives. These are very specific statements that should assist local school systems in developing curriculum at appropriate grade levels.

Theme: Each grade level has a broad theme (i.e., Exploring Technology, Invention and Innovation, Technological Systems, Foundations of Technology, Impacts of Technology, Technological Issues and Engineering Design). These titles correspond to course guides that have been and are being developed by the Center to Advance the Teaching of Technology and Science (CATTS), which is the professional development arm of the International Technology Education Association (ITEA). They are included to help further guide instruction at the various grade levels.

Grade Levels: Based on the overarching standards, indicators and objectives were written grade-by-grade at the middle school level (6th, 7th and 8th) and at the nine through twelve-grade band.

Maryland High School Graduation Requirement in Technology Education: The italicized indicators and objectives in the nine through twelve-grade band specify the content students must achieve to earn the Maryland High School Graduation Requirement in Technology Education. **Alignment to Standards:** There are references throughout where the document aligns to the ITEA Standards for Technological Literacy and Maryland's Voluntary State Curriculum for Science, Mathematics, Reading/English Language Arts and Social Studies.

Key to Abbreviations:

- ITEA STL (International Technology Education Association Standard for Technological Literacy)
- ITEA-CATTS (Center to Advance the Teaching of Technology and Science)
- VSC (Maryland Voluntary State Curriculum)

*from the State Standard see www.marylandpublicschools.org for standards

The Nature of Technology:

Students will develop an understanding of the nature of technology.

| Indicator Statement/Objective | Correlating Page Number |
|---|---|
| Indicator Statement: | |
| Develop an understanding of the nature, characteristics and scope of technology. | 17–19, 46–53, 60–79, 82, 85–98, 178–187, 640–641 |
| Refine and extend a conceptual understanding of new words regarding technology. | 28, 41, 54, 77, 100, 120, 154, 172, 188, 203, 219, 238, 253, 268, 287, 315, 339, 355, 372, 393, 414, 436, 458, 474, 503, 518, 535, 560, 588, 611, 632, 650, 672, 683, 703, 720, 725–750 |
| Analyze various definitions of “technology.” | 16–19 |
| <i>Explain that technology creates new economic opportunities and social benefits and, at the same time, produces new social problems.</i> | 20–21, 105–109, 644–645, 690–702, 715–719 |
| Recognize and explain that technological innovation is often driven by the profit motive. | 17–18, 46–48, 82, 640–641 |
| Explain that technology liberates us from demeaning and demanding labor and, therefore, creates more leisure. | 34–35, 63–75, 691–695, 706–710, 718 |
| Explain that technology has increased human life span by conquering many debilitating diseases. | 15, 52, 95, 614–631 |
| Describe how technology can be intrusive in our lives and may threaten our right to privacy. | 20–21, 104–109, 714–716 |
| Indicator Statement: | |
| Develop an understanding of the core concepts of technology. | 17–19, 31–40, 82–83, 99, 109–118, 168–170, 178–189, 190–192, 206–214, 218, 641–644, 661–663 |
| Explain that systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems. | 190–191 |
| Explain that the stability of a technological system is influenced by all of the components of the system, especially those in the feedback loop. | 31–40 |
| Explain that selecting resources involves trade-offs between competing values, such as availability, cost, durability, and waste. | 192 |
| Explain that new technologies create new processes. | 19 |
| Explain that management is the process of planning, organizing, and controlling work. | 38, 99, 641–644 |

| Indicator Statement/Objective | Correlating Page Number |
|---|---|
| Recognize and explain <i>that systems-thinking applies logic and creativity with appropriate compromises in complex real-life problems.</i> | 113–114 |
| Explain that requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development. | 82–83, 178–187, 192 |
| Define optimization as an ongoing process of designing or making a product and is dependent on criteria and constraint. | 210–211, 218 |
| Indicator Statement: | |
| Develop an understanding of the relationships among technologies and the connections between technology and other fields of study. | 20–22, 34, 52, 60–76, 97, 108, 117, 148, 171, 187, 198, 213–214, 231, 251, 265, 277, 333, 353, 368, 370, 389, 405, 413, 418–420, 423–424, 429, 442–443, 451, 471, 501, 515, 530, 558, 584, 607, 621–627, 668 |
| Explain that technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. | 60–77 |
| <i>Explain that technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across fields.</i> | 21–22, 60–77 |
| Explain that technological ideas are sometimes protected by the process of patenting. | 61–63 |
| Explain that technological progress promotes the advancement of science and mathematics. | 34, 52, 73, 108, 117, 171, 198, 213–214, 251, 265, 277, 353, 368, 389, 405, 423–424, 442–443, 471, 501, 515, 558, 607, 621–627, 668 |
| <i>Explain the strong relationship between technology and the study of science including the common interest in natural scientific laws, systems, design, and modeling.</i> | 21–22, 30–40, 36–40, 52, 60–77, 84, 113, 117, 179–182, 185, 190–203, 206–219, 224–238, 251, 265, 353, 471, 487, 501, 558, 607, 625, 655–657, 676–679 |
| <i>Express that mathematical concepts such as the use of measurement, symbols, estimation, accuracy, and the idea of scaling and proportion are key to the development of technology.</i> | 73, 171, 198, 210–211, 277, 389, 501, 517, 668 |
| Explain how the development of computer databases has revolutionized research in the social sciences. | 221–222, 233–234, 240–241, 370, 391–392, 442–458, 623, 663, 701–702 |

The Impacts of Technology:

Students will develop abilities to assess the impacts of technology.

| Indicator Statement/Objective | Correlating Page Number |
|---|---|
| Indicator Statement: Develop abilities to assess the impacts of products and systems. | 344–354, 634–635, 674–702 |
| <i>Refine and extend comprehension skills by selecting, reading, analyzing and evaluating a variety of print and electronic texts about products and systems. (VSC Reading Comprehension /Informational Texts)</i> | In Teacher’s Wraparound Edition, standard is in numerous “Applying Your Knowledge” chapter sections and “Extend” and “Figure Discussion” teacher’s notes. |
| Collect information and evaluate its quality. | 634–635 |
| Defend and rationalize the development and use of a proposed technology. At least: <i>Who will have access to the technology?</i> <i>Who will control it?</i> <i>What are the costs of not developing or using the technology?</i> <i>Who will benefit and who will lose by the technology?</i> <i>What will the impact of the technology be on my family, my community, and me?</i> | 17–21, 61–63, 75–76, 104–107, 185, 352–354, 430, 664–665, 671, 692–695, 700–702, 706–709, 718–719 |
| Indicator Statement: Develop an understanding of the cultural, social, economic, and political effects of technology. | 17–21, 44–46, 105–109, 185–187, 644–649, 653–655, 665–671, 690–702, 715–719 |
| Explain that changes in society caused by the use of technology can range from gradual to rapid and from subtle to obvious. | 44–46, 107–109, 692–695, 718–719 |
| Explain that decisions about the use of technology involve trade-offs between positive and negative effects. | 20–21, 105–107, 644–645, 690–702, 715–718 |
| Cite instances where ethical considerations have impacted the development, selection, and use of technologies. | 185–187 |
| <i>Explain how the transfer of technology from one society to another affects culture, society, economics, and politics.</i> | 17–19, 700–702 |
| Explain situations where technological development has magnified the inequities among peoples and societies. | 692, 700–702 |
| <i>Justify the contention that individual citizens have to make informed decisions about the development and use of technology.</i> | 714–715 |

| Indicator Statement/Objective | Correlating Page Number |
|--|--|
| Indicator Statement: | |
| Develop an understanding of the effects of technology on the environment. | 20–21, 111–113, 352–354, 496–498, 543–544, 627–629, 691–692, 696–700, 715–718 |
| Explain that humans devise technologies to reduce the negative consequences of other technologies. | 352–354 |
| <i>Analyze the relationship between technological processes and natural processes.</i> | 20–21, 258–268, 352–354, 529–534, 538–559, 569–587, 691–692 |
| <i>Investigate technologies designed to reduce the negative consequences of other technologies.</i> | 352–354 |
| Research and report on processes (reusing, reducing, and recycling) that conserve water, soil, and energy. | 352–354 |
| Assess the effectiveness of the use of technology to monitor environmental conditions. | 691–692, 695–696 |
| Indicator Statement: | |
| Develop an understanding of the role of society in the development and use of technology. | 61–63, 75–76, 104, 430, 653–654, 663–665, 671, 692, 700–702, 706–709 |
| <i>Analyze how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.</i> | 104, 706–709 |
| <i>Defend the proposition that the evolution of civilization has been directly affected by, and has been in turn affected, the development and use of tools and materials.</i> | 19–20, 24–27, 32–34, 63–72, 127–139, 165–168 |
| <i>Explain that early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.</i> | 24, 374 |
| Analyze the development and use of technology in the pre-agricultural, agricultural, industrial, and information ages. | 24–25, 26–27, 134, 140–142, 144–148, 224, 425, 492, 540–542, 706–709 |
| Identify and describe instances where societal opinions and demands or corporate interests have influenced the decision to develop a technology. | 49, 75, 640–649, 652–665, 669–671, 674–682, 714–715 |
| Explain that a number of different factors, such as advertising, the strength of the economy, the goals of the company, and the latest fads contribute to shaping the design of and demand for various technologies. | 61–63, 75–76, 430, 663–665, 671, 692, 700–702 |

| Indicator Statement/Objective | Correlating Page Number |
|---|---|
| Indicator Statement: Develop an understanding the influence of technology on history. | 17–21, 24–27, 32–34, 60–72, 75–76, 97, 127–142, 144–148, 157–160, 165–168, 187, 224, 413, 425, 451, 492, 530, 540–542, 584, 656–657, 692–695, 706–709 |
| Analyze how different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values. | 690, 700–702 |
| Explain that most technological development has been evolutionary, the result of a series of refinements to a basic invention. | 17–19, 24–27, 60, 157–160, 656–657 |
| Explain that the evolution of civilization has been directly affected by, and has in turn affected the development of tools and materials. | 19–20, 24–27, 60–63, 75–76, 692–695 |
| Explain that throughout history, technology has been a powerful force in reshaping the social, cultural, political, and economic landscape. | 17–20, 24–27, 60–63, 75–76, 692–695 |
| Explain that the Iron Age was defined by the use of iron and steel as the primary materials for tools. (ITEA, STL 7-K) | 24–25, 540–542 |
| Explain that the Middle Ages saw the development of many technological devices that produced long-lasting effects on technology and society. | 25, 146, 541–542 |
| Explain that the Renaissance, a time of rebirth of the arts and humanities, was also an important period in the history of technology. | 26 |
| Explain that the Industrial Revolution saw the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time. | 26–27, 134, 140–142, 144–148, 224, 425, 492, 708–709 |
| Explain that the Information Age places emphasis on the processing and exchange of information. | 27, 709 |

Engineering Design and Development:

Students will demonstrate knowledge of and apply the engineering design and development process.

| Indicator Statement/Objective | Correlating Page Number |
|---|--|
| Indicator Statement: | |
| Develop an understanding of the attributes of design. | 36–37, 82–84, 179–187, 192–202, 206–218, 224–237 |
| <i>Explain that the design process is a systematic, iterative, approach to problem solving that yields design solutions.</i> | 36–37, 80, 82–84, 178–188 |
| Explain that the design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating a design, using specifications, refining a design, creating or making it, and communicating processes and results. | 36–37, 83–84, 179–182, 192–202, 206–214, 224–237 |
| Explain that design problems are seldom presented in a clearly defined form. | 82–83, 183–187 |
| Analyze the phases of the design process. | 36–37, 82–84 |
| Explain why designs need to be continually checked and critiqued, and the ideas of the design must be redefined and improved. | 83–84, 195–196, 214–218 |
| Explain that requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other. | 82–83, 192 |
| Indicator Statement: | |
| Develop an understanding of engineering design. | 36–37, 83–84, 178–187, 192, 212–218, 224–237, 374–392 |
| Describe the personal characteristics involved in engineering. At least: <i>Creativity</i> <i>Resourcefulness</i> <i>Ability to visualize and think abstractly</i> | 36–37, 82–84, 178–187, 224–237 |
| Explain that established design principles are used to evaluate existing designs, to collect data, and to guide the design process. | 231, 374–392 |
| Explain that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. | 36–37, 82–84, 178–187, 224–237 |

| Indicator Statement/Objective | Correlating Page Number |
|--|--|
| Explain that a prototype is a working model used to test a design concept by making actual observations and necessary adjustments. | 84, 212–213 |
| Explain that the process of engineering design takes into account a number of factors. | 214–218 |
| <i>Explain constraints on the engineering design process.</i> <i>At least:</i> <i>Safety</i> <i>Reliability</i> <i>Economic considerations</i> <i>Quality control</i> <i>Environmental concerns</i> <i>Manufacturability</i> <i>Maintenance</i> <i>Human factors engineering (ergonomics)</i> | 82–83, 184–185, 214–218 |
| Indicator Statement: Develop abilities to apply and analyze the design process. | 82–84, 182–187, 190–203, 224–237, 242–243, 396–399, 416–417, 438–440, 460–461 |
| Identify the design problem to solve and decide whether to address it. | 82–83, 183–187, 194 |
| Identify criteria and constraints and determine how these will affect the design process. | 82–83, 182, 184–185 |
| Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product. | 83–84 |
| Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed. | 84, 206–214 |
| Develop and produce a product or system using a design process. | 190–201, 242–243, 396–399, 416–417, 438–440, 460–461 |
| Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models. | 84, 224–237 |
| <i>Define the problem.</i> | 182–185 |
| <i>Brainstorm.</i> | 194 |
| <i>Research and generate ideas.</i> | 47, 654–658 |
| <i>Identify criteria and specify constraints.</i> | 184–185 |

| Indicator Statement/Objective | Correlating Page Number |
|---|---|
| <i>Explore possibilities.</i> | 182 |
| <i>Select an approach.</i> | 427 |
| <i>Develop a design proposal.</i> | 190–203 |
| <i>Make a model or prototype.</i> | 212–213 |
| <i>Test and evaluate the design.</i> | 84, 182, 206–219, 347–349 |
| <i>Redesign.</i> | 196 |
| <i>Create or make it.</i> | 190–203 |
| <i>Communicate processes or results.</i> | 224–238 |
| Indicator Statement: | |
| Select and use tools and equipment correctly and safely. | 34, 63–69, 127–139, 165–168, 300 |
| <i>Select and use the appropriate tools and equipment in:</i> <i>making two-dimensional and three-dimensional representations of design solutions.</i> <i>forming and molding processes.</i> <i>machining processes.</i> <i>assembly processes.</i> | 206–214, 296–304, 306–309 |
| <i>Select and use appropriate tools based on the properties of materials.</i> | 127–131 |
| <i>Select and use tools and instruments in the testing and evaluation of design solutions.</i> | 206–219 |
| Indicator Statement: | |
| Develop an understanding of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. | 46–48, 178–187, 654–658 |
| Explain that research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace. | 46–48, 654–658 |
| Explain that not all problems are technological, and not every problem can be solved using technology. | 179 |
| Explain that technological problems require a multidisciplinary approach. | 178–187 |
| <i>Apply the research and development problem-solving approach to prepare devices and systems for the marketplace.</i> | 654–658 |
| Explain why technological problems must be researched before they can be solved. | 180–187 |

| Indicator Statement/Objective | Correlating Page Number |
|--|---|
| Identify and describe problems that cannot be solved through the use of technology. | 179 |
| Indicator Statement: Develop abilities to use and maintain technological products and systems. | 126–153, 221–222, 239–241, 250–252, 347–350, 398–399, 460–461, 514–515, 634–635, 675–680 |
| Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. | 239 |
| <i>Diagnose a system that is malfunctioning and use tools, materials, and knowledge to repair it.</i> | 250–252, 347–350, 677–679 |
| Operate systems so that they function in a way they were designed. | 151–153, 155 |
| <i>Troubleshoot, analyze and maintain systems to ensure safe and proper function and precision.</i> | 126–153, 347–350, 677–679 |
| <i>Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.</i> | 221–222, 240–241, 398–399, 460–461, 634–635 |

Core Technologies:

Students will demonstrate knowledge of and skills related to the core technologies, the building blocks of the designed world.

| Indicator Statement/Objective | Correlating Page Number |
|--|---|
| Indicator Statement: | |
| Discuss the functioning and applications of core technologies applied in common technology systems. | 246–252, 254–267, 270–286, 290–314, 318–338, 344–354, 362–370, 374–392, 400–413, 418–435, 442–457, 466–473, 476–502, 506–517, 526–534, 538–559, 566–587, 592–610, 614–631 |
| <i>Describe the core technologies (mechanical, structural, electrical, electronic, thermal, fluid, optical, bio, and material) as they are applied in the designed world.</i> | 270–286, 529–559, 572–587, 594–610, 621–631 |
| Analyze the functioning of the core technologies in the designed world. In terms of: <i>common components</i> <i>basic system design</i> <i>safety</i> <i>simple controls</i> <i>system performance evaluation</i> | 30–40, 44–53, 60–76, 80–99, 104–119, 151–153, 246–252, 254–267, 270–286, 290–314, 318–338, 344–354, 362–370, 374–392, 400–413, 418–435, 442–457, 466–473, 476–502, 506–517, 526–534, 538–559, 566–587, 592–610, 614–631 |
| Indicator Statement: | |
| Analyze the functioning and applications of mechanical systems. | 271–275 |
| <i>Identify and describe applications of mechanical technology in the designed world.</i> | 65–69, 557–558 |
| <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Levers</i></p> <p><i>Inclined planes</i></p> <p><i>Wedges</i></p> <p><i>Wheels and axles</i></p> <p><i>Pulleys</i></p> <p><i>Screws</i></p> <p><i>Gears</i></p> <p><i>Cams</i></p> <p><i>Linkages</i></p> | |

| Indicator Statement/Objective | Correlating Page Number |
|--|---|
| <p><i>Explain science concepts and mathematic processes applied in mechanical technology.</i></p> <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Force</i></p> <p><i>Motion</i></p> <p><i>Energy</i></p> <p><i>Work</i></p> <p><i>Power</i></p> <p><i>Efficiency</i></p> <p><i>Gravity</i></p> <p><i>Friction</i></p> | <p>471, 526–529, 695</p> |
| <p>Indicator Statement:</p> <p>Analyze the functioning and applications of structural systems.</p> | |
| <p><i>Identify and describe applications of structural technology in the designed world.</i></p> <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Post and beam structures</i></p> <p><i>Frame structures</i></p> <p><i>Suspension structures</i></p> <p><i>Cantilever structures</i></p> <p><i>Mass structures</i></p> <p><i>Pressurized structures</i></p> | <p>335–338, 476, 479, 482, 484–490, 492, 494–495, 500</p> |
| <p><i>Explain science concepts and mathematical concepts applied in mechanical technology.</i></p> <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Compression</i></p> <p><i>Tension</i></p> <p><i>Efficiency</i></p> <p><i>Center of gravity</i></p> | <p>73, 171, 198, 251, 271, 277, 353, 471, 501, 517, 558, 625, 668</p> |
| <p>Indicator Statement:</p> <p>Analyze the functioning and applications of materials technology.</p> | |
| <p><i>Identify and describe applications of materials technology in the designed world.</i></p> <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Metals</i></p> <p><i>Alloys</i></p> <p><i>Nonmetals</i></p> <p><i>Composites</i></p> <p><i>Biomaterials</i></p> | <p>71–72, 265, 530, 533–534</p> |

| Indicator Statement/Objective | Correlating Page Number |
|---|--|
| <p><i>Explain science concepts and mathematical concepts applied in materials technology.</i></p> <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Strength of shapes</i></p> <p><i>Forces</i></p> <p><i>Center of gravity</i></p> <p><i>Moments of inertia</i></p> <p><i>Stress</i></p> <p><i>Strain</i></p> <p><i>Deflection</i></p> <p><i>Efficiency</i></p> | 471, 489, 501, 527, 557 |
| <p>Indicator Statement:</p> <p>Analyze the functioning and applications of electrical systems.</p> | 71–72, 265, 530, 533–534 |
| <p><i>Identify and describe applications of electrical technology in the designed world.</i></p> <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Generators</i></p> <p><i>Electric motors</i></p> <p><i>Alarm systems</i></p> <p><i>Automobile electrical systems</i></p> | 144–145, 479, 553–554 |
| <p><i>Explain science concepts and mathematical concepts applied in electrical technology.</i></p> <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Measure resistance</i></p> <p><i>Conduction</i></p> <p><i>Semi-conduction</i></p> <p><i>Current (alternating and direct)</i></p> <p><i>Voltage</i></p> <p><i>Power</i></p> <p><i>Circuits</i></p> <p><i>Magnetism</i></p> <p><i>Ohm's law</i></p> <p><i>Ratio</i></p> | 72, 108, 144, 419–420, 528–529, 550–551, 607 |
| <p>Identify and describe how various types of electric circuits (i.e., series and parallel) provide a means of transferring and using electrical energy to produce heat, light, sound, as well as chemical changes.</p> | 92, 538–539, 551–555 |
| <p>Analyze the magnetic effects of current (i.e., electromagnet) and the electric effects of magnets (i.e., motors).</p> | 419–422, 482–483, 553–554 |

| Indicator Statement/Objective | Correlating Page Number |
|---|--------------------------|
| Solve for the unknown in a linear equation related to electrical technology. | |
| Indicator Statement: Analyze the functioning and applications of electronic technology systems. | 418–435, 442–457 |
| <i>Identify and describe applications of electronic technology in the designed world.</i> <i>Such as:</i> <i>Computers</i> <i>Telephones</i> <i>Radio and television</i> | 418–435, 442–457 |
| <i>Explain science concepts and mathematical concepts applied in electronic technology.</i> <i>Such as:</i> <i>Electromagnetic waves</i> <i>Digital logic</i> <i>Binary numbers</i> <i>Frequency</i> <i>Amplification</i> | 147–148, 419–425 |
| Indicator Statement: Analyze the functioning and application of thermal technology systems. | 549–553 |
| <i>Identify and describe applications of thermal technology in the designed world.</i> <i>Such as:</i> <i>Thermometer</i> <i>Refrigerator</i> <i>Furnace</i> <i>Air conditioner</i> <i>Heat engines</i> | 549–553 |
| <i>Explain science concepts and mathematical concepts applied in thermal technology.</i> <i>Such as:</i> <i>Convection</i> <i>Conduction</i> <i>Radiation</i> <i>Insulation</i> <i>Efficiency</i> | 531, 550–553, 695–696 |
| Indicator Statement: Analyze the functioning and applications of fluid technology systems. | 544, 556, 558–559 |

| Indicator Statement/Objective | Correlating Page Number |
|---|---|
| <p><i>Identify and describe applications of fluid technology in the designed world.</i></p> <p>Such as:</p> <p><i>Air pumps</i></p> <p><i>Water pumps</i></p> <p><i>Automobile brakes</i></p> <p><i>Airfoils</i></p> | <p>495, 544, 552, 558–559</p> |
| <p><i>Explain science concepts and mathematical concepts applied in fluid technology.</i></p> <p>Such as:</p> <p><i>Pressure</i></p> <p><i>Vacuum</i></p> <p><i>Volume</i></p> <p><i>Area</i></p> <p><i>Ratio</i></p> | <p>160–163, 171, 558–559</p> |
| <p>Indicator Statement:</p> <p>Analyze the functioning and application of optical systems.</p> | <p>72, 111–113, 281–282, 361, 422–423, 429</p> |
| <p><i>Identify and describe applications of optical technology in the designed world.</i></p> <p>Such as:</p> <p><i>Microscope and magnifier</i></p> <p><i>Laser</i></p> <p><i>Fiber optics</i></p> <p><i>Optical telescope</i></p> <p><i>Bar code reader</i></p> <p><i>Scanner</i></p> | <p>111–113, 136–138, 281–282, 303, 361, 422–423, 429–435</p> |
| <p><i>Explain science concepts and mathematical concepts applied in optical technology.</i></p> <p>Such as:</p> <p><i>Light waves</i></p> <p><i>Frequency</i></p> <p><i>Period</i></p> <p><i>Reflection</i></p> <p><i>Refraction</i></p> <p><i>Diffraction</i></p> <p><i>Proportion (direct and indirect)</i></p> <p><i>Superposition</i></p> <p><i>Interference</i></p> <p><i>Doppler effect</i></p> | <p>72, 216, 231, 235–236, 364–365, 381, 401–403, 419–425, 538–539</p> |

| Indicator Statement/Objective | Correlating Page Number |
|---|--|
| Indicator Statement: Analyze the functioning and application of biotechnology systems. | 531–532, 548, 566–588, 592–611, 614–632 |
| <i>Identify and describe applications of biotechnology in the designed world.</i> <i>Such as:</i> <i>Genetically modified food</i> <i>DNA fingerprinting</i> <i>Oil biodegradation</i> <i>Insulin production</i> <i>Bioethics</i> | 531–532, 548, 566–588, 592–611, 614–632 |
| <i>Explain science concepts and mathematical concepts applied in biotechnology.</i> <i>Genes</i> <i>Genetic code</i> <i>DNA structure</i> <i>Enzymes</i> <i>Proteins</i> <i>Cloning</i> <i>Mutations</i> <i>Chromosome number</i> <i>Genetic recombination</i> <i>Anaerobic conversion</i> <i>Fermentation</i> | 15, 52, 548, 586–587, 592, 600–601, 604–605, 716 |

The Designed World:

Students will demonstrate knowledge of the major enterprises that produce the goods and services of the designed world.

| Indicator Statement/Objective | Correlating Page Number |
|---|---|
| Indicator Statement: | |
| Discuss the major enterprises of the designed world. | 246–252, 254–267, 270–286, 290–314, 318–338, 344–354, 362–370, 374–392, 400–413, 418–435, 442–457, 466–473, 476–502, 506–517, 526–534, 538–559, 566–587, 592–610, 614–631 |
| <p>Analyze the major enterprises of the designed world (medical, agricultural and related biotechnologies, energy and power, information and communication, transportation, manufacturing, and construction):</p> <p>At least -</p> <p><i>Occupations</i></p> <p><i>Processes</i></p> <p><i>Products</i></p> <p><i>Problems</i></p> | <p>18, 43, 48, 79, 103, 119, 130, 167, 180, 205, 223, 237, 246–252, 254–267, 270–286, 289–314, 318–338, 344–354, 362–371, 374–392, 400–413, 418–435, 441–457, 466–473, 476–502, 506–517, 526–534, 538–559, 566–587, 592–610, 614–631, 640–650, 652–672, 674–683, 692, 695–702, 705, 710–719</p> |
| Indicator Statement: | |
| Develop an understanding of medical technologies. | 15, 52, 95, 614–631 |
| <p><i>Explain the functioning and application of medical processes and products.</i></p> <p><i>Such as:</i></p> <p><i>Prevention and rehabilitation</i></p> <p><i>Vaccines and pharmaceuticals</i></p> <p><i>Surgical procedures</i></p> | 620–631 |
| <p>Explain that medical technologies include prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, genetic engineering, and the systems within which health is protected and maintained.</p> | 95, 614–632 |
| <p>Explain that telemedicine reflects the convergence of technological advances and advances in other fields.</p> <p>At least -</p> <p><i>Medicine</i></p> <p><i>Telecommunications</i></p> <p><i>Virtual presence</i></p> <p><i>Computer engineering</i></p> | 620–631 |

| Indicator Statement/Objective | Correlating Page Number |
|--|---|
| Indicator Statement: Develop an understanding of agriculture and related biotechnologies. | 15–29, 52, 85–86, 565–613, 620–631, 689–704 |
| Explain the production and application of agricultural processes and products. Such as: <i>Food</i> <i>Fiber</i> <i>Fuel</i> <i>Chemical</i> | 70, 74–75, 85–86, 255, 258–260, 530–532, 548, 566–613 |
| Explain the application of biotechnology processes and products. At least – <i>Agricultural</i> <i>Pharmaceuticals</i> <i>Food and beverages</i> <i>Medicine</i> <i>Energy</i> | 530–532, 548, 564–637 |
| Explain that agriculture includes a combination of businesses that use a wide array of products and systems to produce, process, and distribute food, fiber, fuel, chemicals, and other useful products. | 567–586 |
| Explain that biotechnology has applications in such as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment, and genetic engineering. | 15, 52, 565, 586–587, 592–613, 620–631 |
| Indicator Statement: Develop an understanding of energy and power technologies. | 70, 74–75, 91–92, 139–145, 285, 526–534, 538–559 |
| Explain that energy cannot be created nor destroyed; however, it can be converted from one form to another. | 92, 139–145, 531, 539–555 |
| Explain that energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others. | 74–75, 91–92, 285, 529–531 |
| Explain that it is impossible to build an engine to perform work that does not exhaust thermal energy to the surroundings. | 526–534, 538–559 |
| Explain that energy resources can be renewable or non-renewable. | 70, 531–534, 538–559 |
| Explain that power systems must have a source of energy, a process, and loads. | 91–92, 556–559 |

| Indicator Statement/Objective | Correlating Page Number |
|---|---|
| <p><i>Explain the production, conversion, transmission, and application of different forms of energy.</i></p> <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Mechanical</i></p> <p><i>Radiant</i></p> <p><i>Chemical</i></p> <p><i>Thermal</i></p> <p><i>Electrical</i></p> <p><i>Nuclear</i></p> | <p>539–559</p> |
| <p>Indicator Statement:</p> <p>Develop an understanding of information and communication technologies.</p> | <p>86–88, 145–151, 361–371, 374–391, 400–413, 418–435, 442–457</p> |
| <p>Explain that information and communication systems include inputs, processes, and outputs associates with sending and receiving information.</p> | <p>86–88, 145–151</p> |
| <p>Explain that information and communication systems allow information a to be transferred from human to human, human to machine, machine to human, and machine to machine.</p> | <p>365–366</p> |
| <p>Explain that information and communication systems can be used to inform, persuade, entertain, control, manage, and educate.</p> | <p>364, 418–435</p> |
| <p>Identify and describe the parts of a communication system.</p> <p style="padding-left: 40px;">At least -</p> <p><i>Source</i></p> <p><i>Encoder</i></p> <p><i>Transmitter</i></p> <p><i>Receiver</i></p> <p><i>Decoder</i></p> <p><i>Destination</i></p> | <p>364–370</p> |
| <p>Explain that there are many ways to communicate information, such as graphic and electronic means.</p> | <p>86–88, 361, 366–370, 374–392, 403–413, 422–434</p> |
| <p>Explain that technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.</p> | <p>442–457</p> |

| Indicator Statement/Objective | Correlating Page Number |
|---|---|
| <p>Analyze the functioning and applications of information processing machines.</p> <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Printing</i></p> <p><i>Telephone</i></p> <p><i>Radio and television</i></p> <p><i>Computer</i></p> | <p>146–148, 374–392, 423–435, 442–457</p> |
| <p>Indicator Statement:</p> <p>Develop an understanding of transportation technologies.</p> | |
| <p>Explain that transportation plays a vital role in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.</p> | <p>467–468, 506–517</p> |
| <p>Analyze transportation systems.</p> <p style="padding-left: 40px;"><i>Such as:</i></p> <p><i>Land</i></p> <p><i>Water</i></p> <p><i>Air</i></p> <p><i>Space</i></p> | <p>468–502</p> |
| <p>Analyze the role transportation plays in the operation of other enterprises, such as manufacturing, construction, communication, health and safety, and agriculture.</p> | <p>467–468, 506–517</p> |
| <p>Explain that intermodalism is the use of different modes of transportation in an interconnected system that moves people and goods.</p> | <p>466–473</p> |
| <p>Research and report on “smart technologies.”</p> | <p>23, 114–116, 496–498, 700–702</p> |
| <p>Indicator Statement:</p> <p>Develop an understanding of manufacturing technologies.</p> | |
| <p>Analyze manufacturing processes.</p> <p style="padding-left: 40px;"><i>At least -</i></p> <p><i>Designing</i></p> <p><i>Development</i></p> <p><i>Producing</i></p> <p><i>Servicing</i></p> | <p>93–95, 290–314, 661</p> |

| Indicator Statement/Objective | Correlating Page Number |
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| Describe mechanical processes that change the form of materials. At least - Separating Forming Combining Conditioning | 271–275, 296–306 |
| Explain that materials have different qualities and may be classified as natural, synthetic, or mixed. | 60–76, 254–267 |
| Explain that durable goods are designed to operate for a long period of time, while non-durable goods are designed to operate for a short period of time. | 246–252 |
| Explain that marketing involves establishing a product's identity, conducting research on its potential, advertising it, distributing it, and selling it. | 663–665 |
| Classify manufacturing systems as being customized production, batch production, or continuous production. | 134, 658–663 |
| Describe how the interchangeability of parts increases the effectiveness of a manufacturing process. | 16–27, 224, 708–709 |
| Research chemical technologies used to modify or alter chemical substances in the manufacturing process. At least – Synthetic fibers Pharmaceuticals Plastics Fuels | 256–258, 270–286 |
| Indicator Statement: Develop an understanding of construction technologies. | 88–91, 246–252, 318–337, 347–351, 678 |
| Explain that infrastructure is the underlying base or basic framework of a system. | 318–338 |
| Explain that structures are constructed using a variety of processes and procedures. | 88–91, 678 |
| Explain that the design of structures includes a number of requirements. | 318–338 |
| Explain that structures require maintenance, alteration, or renovation periodically to improve them or to alter their intended use. | 91, 246–252, 347–351 |

| Indicator Statement/Objective | Correlating Page Number |
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| Explain that structures can include prefabricated materials. | 318–338 |
| <i>Analyze heavy engineering structures.</i> Highways Rail lines Bridges Airports Canals Pipelines Power transmission and communication towers Hydroelectric and flood control dams | 338, 470–473, 481–482, 506–513 |
| <i>Analyze types of buildings.</i> Such as: <i>Residential</i> <i>Commercial</i> <i>Industrial</i> | 319 |
| Analyze the steps in the construction process. At least - Preparing the site Setting foundations Building the framework Enclosing the structure Installing utilities Finishing the interior and exterior Completing the site | 318–338 |