Technology Alignment of Benchmarks and Indicators
GRADE 7

Standard 1 Nature of Technology

Students develop an understanding of technology, its characteristics, scope, core concepts* and relationships between technologies and other fields.Students learn that technology extends human potential by allowing people to do things more efficiently than they would otherwise be able to do. Students learn that useful technological development is a product of human knowledge, creativity, invention, innovation, motivation and demand for new products and systems. They learn that the natural and human-made designed worlds are different, and that tools and materials are used to alter the environment. Students learn that the development of emerging technology is exponential, driven by history, design, commercialization, and shaped by creative/inventive thinking, economic factors and cultural influences.*The core concepts of technology include systems, resources, requirements, optimization and trade-offs, processes and controls.

Benchmark A: Analyze information relative to the characteristics of technology and apply in a practical setting.

Grade Seven

Technology

Development

1. Describe the factors involved in developing products and systems using technology (e.g., market survey, design, development, prototyping, assessing, producing, quality assurance, marketing).

2. Develop technological solutions to problems.

3. Discuss ways that technology is linked to creativity and innovation.

Benchmark B: Apply the core concepts of technology in a practical setting.

Grade Seven

Systems

1. Differentiate between open-loop and closed-loop systems: recognize that an open-loop system has no feedback path and requires human intervention, while a closed-loop system uses feedback.

2. Describe ways that technological systems can be connected to one another.

Requirements

3. Identify parameters that may be placed on the development of a product or system (e.g., cost, time, size).

Controls

4. Cite examples of controls, and predict resultant changes in a system for that control (e.g., the heating system thermostat regulates the air temperature of the room).

Trade-offs

5. Infer that malfunctions of any part of a system may affect the function and quality of the system.

Processes

6. Recognize that maintenance is the process of inspecting and servicing of a product or system on a regular basis.

Benchmark C: Analyze the relationships among technologies and explore the connections between technology and other fields of study.

Grade Seven

Technology Interaction

1. Describe the situational interdependence of technologies (e.g., space shuttle crew depends on communication technologies in order to maneuver the craft).

2. Identify products that have been applied to alternative settings.

3. Explain how knowledge from other fields of study may impact the development of technological systems and products.

<u>Standard 2 Technology and Society Interaction</u>

Students recognize interactions among society, the environment and technology, and understand technology's relationship with history. Consideration of these concepts forms a foundation for engaging in responsible and ethical use of technology.Students learn that the interaction between society and technology has an impact on their lives, that technology may have unintended consequences which may be helpful or harmful. They learn that interaction of technology will affect the economy, ethical standards, environment and culture. Students evaluate the impact of products or systems by gathering and synthesizing information, analyzing trends and drawing conclusions. Students analyze technological issues and the implications of using technology. They acquire technological understanding, and develop attitudes and practices that support ethical decision-making and lifelong learning.

Benchmark A: Analyze technologically responsible citizenship.

Grade Seven

Technology and Citizenship

1. Classify how new technologies have resulted from the demands, values and interests of individuals, businesses, industries and societies.

2. Relate ways that the uses of inventions and innovations have led to changes in society and the creation of new needs and wants.

3. Identify how societal expectations drive the acceptance and use of products and systems (e.g., impact of the automobile in Ohio 1891 to the present).

Benchmark B: Describe and explain the impact of technology on the environment.

Grade Seven

Technology and the Environment

1. Explain how the development and use of technologies often put environmental and economic concerns in direct competition with one another.

Trade-offs

2. Explain the life cycle of a typical product or structure.
Product Life Cycle
3. Describe the proper disposal and/or recycling of used products (e.g., electronic equipment, lawnmower oil, batteries).
Benchmark C: Describe how design and invention have influenced technology throughout history.
Grade Seven
Technology and History
1. Explain how the design and construction of structures for service or convenience have evolved from the development of techniques for measurement, controlling systems, and the understanding of spatial relationships.
2. Analyze a design or invention and explain its historical importance (e.g., 1735 invention of a timepiece that English ships used to accurately navigate longitude position around the world).
Benchmark D: Articulate intellectual property issues related to technology and demonstrate appropriate, ethical and legal use of technology.
Grade Seven
Intellectual Property
1. Analyze a situation to determine the steps necessary to respect intellectual property rights including patents, copyrights, trade names and trademarks.
2. Discuss plagiarism and its ramifications.
3. Understand that installation of software requires an appropriate software license, and that the license determines how many times the software may be installed (e.g., does the license allow the software to be installed on more than one computer?).
4. Understand that Web page content may not be copied and imported into a new owner'sWeb page.
5. Understand that photos, images, graphics, sounds or videos displayed on the Internet are generally copyright protected and may not be copied, pasted, saved, imported, or used in new content without permission of the copyright owner.
6. Explore appropriate use of logos, icons, graphics, etc. in relation to trademark and trade name rights (e.g., understand that trademark logos may not be incorporated into new works without consent of the owner or payment of fees and/or royalties).
7. Analyze situations that arise regarding the use of intellectual property, including ethical considerations.
8. Determine steps necessary to respect intellectual property rights (e.g., obtain permission from the owner, credit the source of the items, pay a license fee to use the item).
Benchmark E: Assess the impact of technological products and systems.
Grade Seven
Technology Assessment
1. Employ the use of instruments with different measuring standards to

collect data (e.g., temperature, acidity—pH; level, voltage, heart rate, speed).
2. Identify trends and monitor potential consequences of technological development.
3. Analyze an environmental health concern and identify the elements of that problem, (e.g., sources of environmental stressors, types of environmental stressors, environmental media, distribution of environmental stressors, and human receptors).

<u>Standard 3 Technology for Productivity Applications</u>
Students learn the operations of technology through the usage of technology and productivity tools. Students use computer and multimedia resources to support their learning. Students understand terminology, communicate technically and select the appropriate technology tool based on their needs. They use technology tools to collaborate, plan and produce a sample product to enhance their learning, and solve problems by investigating, troubleshooting and experimenting using technical resources.
Benchmark A: Demonstrate an understanding of concepts underlying hardware, software and connectivity.
Grade Seven
Understanding Concepts
1. Use vocabulary related to computer and multimedia technology systems (e.g., universal serial bus—USB, hubs and switches).
Understanding Operations
2. Explain how computer components interact.
3. Explain the purpose and different functions of software programs.
Benchmark B: Select appropriate technology resources to solve problems and support learning.
Grade Seven
Problem-solving
1. Solve problems using all available technologies for inquiry, investigation, analysis and presenting conclusions.
Productivity Tools
2. Investigate various formats of video content and methods of presentation (e.g., .mpeg, .avi).
3. Edit video clips using video editing software.
Keyboarding
4. Develop speed and accuracy when keyboarding, and transition to a word processing environment.
Benchmark C: Use productivity tools to produce creative works, to prepare publications and to construct technology-enhanced models.
Grade Seven
Research Tools
1. Use content-specific tools, software and simulations to support learning and research to create educational projects (e.g., aerodynamic model

design, bridge building simulation, design tools, how it works Web-sites).
2. Apply technology resources to support group collaboration and learning throughout the curriculum.

<u>Standard 4 Technology and Communication Applications</u>
Students use an array of technologies and apply design concepts to communicate with multiple audiences, acquire and disseminate information and enhance learning. Students acquire and publish information in a variety of media formats. They incorporate communication design principles in their work. They use technology to disseminate information to multiple audiences. Students use telecommunication tools to interact with others. They collaborate in real time with individuals and groups who are located in different schools, communities, states and countries. Students participate in distance education opportunities which expand academic offerings and enhance learning.
Benchmark A: Communicate information technologically and incorporate principles of design into the creation of messages and communication products.
Grade Seven
Communications
1. Classify reasons to communicate information and explain why technology enhances communication (e.g., to explain, inform, persuade, sell, archive information in ways that reach a variety of audiences).
***Principles of Design* 2. Integrate advanced design features into communication products (e.g., background selection, framing, set design).**
Multimedia Applications
3. Generate multimedia presentations that communicate information for specific purposes.
Benchmark B: Develop, publish and present information in a format that is appropriate for content and audience.
Grade Seven
Productivity Tools
1. Select an appropriate software tool to create and publish print information (e.g., word processor for a report, desktop publishing tool for signs/calendars/newsletters).
2. Distinguish electronic file types and determine extensions including .txt, .rtf, .doc, .pdf and others.
3. Insert original sound files into multimedia presentation (e.g., AVI, WAV, MPEG).
4. Insert copyright-free images (photos/graphics) into multimedia presentations (e.g., GIF, JPEG).
5. Transform digital images by using editing software to:
a. Crop;
b. Rotate, flip, invert;
c. Add text, borders, decorative elements;
d. Adjust color (apply spot coloring, image touch-up);

and
e. Layer or merge images.
Benchmark C: Select appropriate technology communication tools and design collaborative interactive projects and activities to communicate with others.
Grade Seven
1. Compose e-mail messages and incorporate advanced techniques (e.g., include attachments, send to multiple inbox, create address book).
2. Acquire and disseminate information by participating in virtual learning activities (e.g., Web casts, video-conferencing, distance-learning offerings).

<u>Standard 5 Technology and Information Literacy</u>
Students engage in information literacy strategies, use the Internet, technology tools and resources, and apply information-management skills to answer questions and expand knowledge. Students become information-literate learners by utilizing a research process model. They recognize the need for information and define the problem, need or task. Students understand the structure of information systems and apply these concepts in acquiring and managing information. Using technology tools, a variety of resources are identified, accessed and evaluated. Relevant information is selected, analyzed and synthesized to generate a finished product. Students evaluate their information process and product.
Benchmark A: Evaluate the accuracy, authority, objectivity, currency, coverage and relevance of information and data sources.
Grade Seven
Evaluating Sources
1. Distinguish when current copyright dates of sources are important in answering an information need (e.g., science information on cloning, results of an election).
2. Assess the objectivity (ability of an author to present information without bias) of a source when using information.
3. Compare multiple sources (online encyclopedia, Web site, online magazine database, print source) to check accuracy of information (e.g., do facts match on each site?).
4. Determine the scope of coverage for a given source (does the source cover all of the needed information?).
5. Chart information gathered from multiple sources to determine facts to be used in a project.
Benchmark B: Use technology to conduct research and follow a research process model which includes the following: develop essential question; identify resources; select, use and analyze information; synthesize and generate a product; and evaluate both process and product.
Grade Seven
Decide
1. Develop open-ended research questions about a defined information need.

Find

2. Select and evaluate relevant information about a specific topic in several sources.

3. Select information from different types of subscription resources (fee-based, pay-to-use) to meet an information need (e.g., magazine database, picture archive, online encyclopedia).

Use

4. Compile information learned about a topic from a variety of sources.

5. Create information products to share information using different formats (e.g., print, audio recording, digital, video, slide show).

Check

6. Evaluate how information was found and assess the quality of the information product.

Benchmark C: Develop search strategies, retrieve information in a variety of formats and evaluate the quality and appropriate use of Internet resources.

Grade Seven

Internet Concepts

1. Recognize that some Web information requires special software for its use (e.g., discuss what plug-ins are and how they expand the use of the Internet).

Search Strategies

2. Search a student-selected online directory or search engine by subject, keyword, author, title, date and/or format.

3. Use Boolean operators in the search process (e.g., use Boolean logic to expand a search and to limit a search "AND" "OR" "NOT").

4. Perform searches for information in specific formats (e.g., graphics, images, journal articles).

5. Compare information found in searches done on different types of Internet resources (e.g., directory, search engine, meta engine).

Evaluating Sources

6. Report elements of a Web site that make it effective (e.g., describe why the Web site is appropriate for the particular information needed).

Benchmark D: Select, access and use appropriate electronic resources for a defined information need.

Grade Seven

Electronic Resources

1. Compare search results through the use of different keywords (e.g., search for conservation information using "garbage" and search again using "waste disposal").

2. Examine information in different types of subscription (fee-based) databases to locate information for a curricular need (e.g., online encyclopedia, online subject dictionaries, magazine index, picture archive).

<u>Standard 6 Design</u>

Students will apply a number of problem-solving strategies demonstrating

the nature of design, the role of engineering and the role of assessment. Students recognize the attributes of design; that it is purposeful, based on requirements, systematic, iterative, creative, and provides solution and alternatives. Students explain critical design factors and/or processes in the development, application and utilization of technology as a key process in problem-solving. Students describe inventors and their inventions, multiple inventions that solve the same problem, and how design has affected their community. They apply and explain the contribution of thinking and procedural steps to create an appropriate design and the process skills required to build a product or system. They critically evaluate a design to address a problem of personal, societal and environmental interests. Students systematically solve a variety of types of problems using different design approaches including troubleshooting, research and development, innovation, invention and experimentation.

Benchmark A: Evaluate the aesthetic and functional components of a design and identify creative influences.

Grade Seven

Universal Design

1. Evaluate examples of Universal Design use that meet common challenges individuals encounter (e.g., limitations concerning mobility, vision, strength, reach and clarity in communication).

Technical Contradictions

2. Describe how aesthetic and functional components both complement and conflict with each other (e.g., a brace to keep a bookcase from rocking may not be consistent with the beauty of the object).

Research and Development

3. Review existing designs and suggest ways that they can be improved (e.g., how have food containers changed over time and how can they be improved?).

Technical Communication

4. Make two- and three-dimensional representations of the designed solution (e.g., 2-D includes sketches, drawings, and computer-assisted designs—CAD and 3-D includes graphic, mathematical and physical models).

Technical Problem-solving

5. Describe how brainstorming is a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.

***Design Application* 6. Apply a design process to solve a problem in the school (e.g., identify need, research problem, develop solutions, select best solution, build prototype, test and evaluate, communicate, and redesign.**

Technology Assessment

7. Research and diagram the product development life cycle of an invention.

Inventors/Inventions

8. Identify inventors and designers from antiquity who contributed to the development of each of the technological systems (e.g., contributions from Chinese, Greeks, Romans, Arabs, Egyptians and Renissance in Europe).

Benchmark B: Recognize the role of engineering design and of testing in the design process.

Grade Seven

Engineering Design

1. Summarize the role of engineering design.

2. Describe the relationship between engineering, science and mathematics.

3. Describe and test the characteristics of various materials (e.g., strength, color, conductivity).

Benchmark C: Understand and apply research, innovation and invention to problem-solving.

Grade Seven

Technical Contradictions

1. Explain that understanding the function of an object requires a higher level of thinking than focusing on the object itself.

Research and Development

2. Describe how some technological problems are best solved through experimentation.

3. Describe and complete an experiment to evaluate the solution to a problem.

Technical Communication

4. Evaluate the credibility and applicability of information obtained to address a specific problem (e.g., what measurements should be used to build a chair or a piece of clothing? are they based on the prospective customers?).

Technical Problem-solving

5. Discriminate between problems that do and do not have a technological solution (e.g., a recycling system and processes can be designed, but voluntary participation is a public attitude issue).

Technology Transfer

6. Identify the patterns of technological invention (e.g., identify the patterns of invention in current products and systems).

<u>Standard 7 Designed World</u>

Students understand how the physical, informational and bio-related technological systems* of the designed world are brought about by the design process. Critical to this will be students' understanding of their role in the designed world: its processes, products, standards, services, history, future, impact, issues and career connections. Students learn that the designed world consists of technological systems* reflecting the modifications that humans have made to the natural world to satisfy their own needs and wants. Students understand how through the design process the resources: materials, tools and machines, information, energy,

capital, time and people are used in the development of useful products and systems. Students develop a foundation of knowledge and skills through participation in technically oriented activities for the application of technological systems. Students demonstrate understanding, skills and proficient use of technological tools, machines, instruments, materials and processes across technological systems in unique and/or new contexts. Students identify and assess the historical, cultural, environmental, governmental and economic impacts of technological systems in the designed world. *The technological systems areas include energy and power technologies, transportation technologies, manufacturing technologies, construction technologies, information and communication technologies, medical technologies, agricultural and related biotechnologies.

Benchmark A: Develop an understanding of, and be able to, select and use physical technologies.

Grade Seven

Energy and Power

1. Understand that energy can be used to do work using many processes.

2. Describe why it is important for personnel in energy and power technologies to constantly update their knowledge and skills.

3. Understand that power is the rate at which energy is converted from one form to another or transferred from one place to another, or the rate at which work is done.

Transportation

4. Describe how transportation vehicles are made up of subsystems, such as structural, propulsion, suspension, guidance, control and support that must function together for a system to work effectively.

5. Describe how licensure and certification are an integral part of transportation careers (e.g., commercial driver's license, safety inspector's pilot's license).

6. Identify and manipulate the factors that influence vehicle performance (e.g., lift, drag, friction, thrust, pressure and gravity).

Manufacturing

7. Design, develop, fabricate and service a product (e.g., a pop bottle rocket, manufacture toys, clean computer keyboards).

8. Analyze how marketing impacts the selection of the manufacturing process for a product.

9. Safely disassemble a (possibly broken) product and describe what systems are inside, hypothesize how it was manufactured, and explain what materials were used and possibly how it works.

10. Describe a manufacturing organization (e.g., corporate structure, research and development, production, marketing, quality control, distribution).

Construction

11. Identify the components of various building subsystems (e.g., on pictures of classroom or various places in the school, label the electrical,

lighting, HVAC, plumbing, communication and structural subsystems).
12. Identify and construct a type of structure (e.g., a model bridge including arch, beam and suspension) and their appropriate uses (e.g., site, span, resources and load).
Benchmark B: Develop an understanding of, and be able to, select and use informational technologies.
Information and Communication
Grade Seven
Information and Communication
1. Identify the source, encoder, transmitter, receiver, decoder and destination in communication systems.
2. Solve a problem involving information and communication technological systems (e.g., prepare video presentation, set up a communication system between two points in the school).
3. Identify and explain the appropriate tools, machines and electronic devices (e.g., drawing tools, computer-aided design, and cameras) used to produce and/or reproduce design solutions (e.g., engineering drawings, prototypes, and reports).
Benchmark C: Develop an understanding of how bio-related technologies have changed over time.
Grade Seven
Medical
1. Describe how the sanitation processes used in the disposal of medical products help to protect people from harmful organisms and disease, and shape the ethics of medical safety.
2. Describe how previously discarded medical practices are sometimes reinstated.
3. Recognize how the medicines we use affect our ongoing health and attitudes.
4. Explain examples of adaptive or assistive devices (e.g., prosthetic devices, wheelchairs, eyeglasses, grab bars, hearing aids, lifts, braces, computer devices).
Agriculture and Related Biotechnologies
5. Describe a wide range of specialized equipment and practices that are used to improve the production of food, fiber, fuel and the care of animals.
6. Identify artificial ecosystems that are human-made complexes that replicate some aspects of the natural environment.
7. Describe how agricultural products are used to produce fuels (e.g., converting corn to ethanol and soy beans to biodiesel).