Technology Alignment of Benchmarks and Indicators
Grade 8

<u>Standard 1 Nature of Technology</u>
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 Eight
Technology Development
1. Design technological solutions to problems generated by individual or collective needs.
2. Interpret the interrelationship between technology, creativity and innovation.
3. Formulate how a demand for a product may be created through marketing and advertising (e.g., marketing personal computers, music and game devices).
4. Apply multiple factors when developing products and systems to solve problems.

Benchmark B: Apply the core concepts of technology in a practical setting.
Grade Eight
Systems
1. Demonstrate how technological systems can be connected to one another.
Requirements
2. Examine parameters and constraints in the design of a product or system.
Controls
3. Utilize controls to make changes in a system resulting in a desired outcome.
Trade-offs
4. Indicate ways a system malfunction may affect the function and quality of the system.
5. Recognize that trade-offs are the result of the decision-making process,

involving careful compromises among competing factors.

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

Grade Eight

Technology Interaction

1. Demonstrate ways that technological systems interrelate.
2. Suggest products that could be used in an alternative setting.
3. Explain ways that invention and innovation within one field can transfer into other areas of technology.
4. Cite examples of how transferred knowledge has impacted the development of technological systems and products (e.g., 1805 Jacquard weaving loom punch card system influenced development of 1950's computer punch card systems).
5. Describe and cite examples illustrating how different technologies require different processes.

Standard 2 Technology and Society Interaction

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 Eight

Technology and Citizenship

1. Explain how economic, political and cultural issues are influenced by the development and use of technology.
2. Describe how societal expectations drive the acceptance and use of products and systems.
3. Describe how the use of technology affects humans in various ways, including their safety, comfort, choices and attitudes about technology's development and use.

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

Grade Eight

Technology and the Environment

1. Explain how the life cycle of a product or structure may impact the environment.

2. Identify items/products that would benefit the environment if they were designed to be biodegradable.

Emerging Technology 3. Investigate emerging environmental restoration technologies (e.g., electrokinetic remediation to remove chemical contaminants from soil).

Benchmark C: Describe how design and invention have influenced technology throughout history.

Grade Eight

Technology and History

1. Describe how the specialization of function has been at the heart of many technological improvements (e.g., welding: many different processes have been developed to join materials).

2. Examine and compare eras of design in architecture, aviation, transportation, medical instruments and astronomy.

Benchmark D: Articulate intellectual property issues related to technology and demonstrate appropriate, ethical and legal use of technology.

Grade Eight

Intellectual Property

1. Demonstrate legal and ethical practices when completing projects/schoolwork.

2. Adhere to copyright restrictions.

3. Define fair use in regard to technology-generated educational materials.

4. Discuss software piracy, its impact on the technology industry, and possible repercussions to individuals and/or the school district.

5. Determine copyright, trademark, trade name restrictions to consider when using the Internet or other technology resources (e.g., do not violate intellectual property restrictions when using materials).

Benchmark E: Assess the impact of technological products and systems.

Grade Eight

Technology Assessment

1. Design and use appropriate instruments to gather data (e.g., design, fabricate and use a balance scale).

2. Interpret and evaluate the accuracy of the information obtained during a test or experiment and determine if it is useful.

Environmental Health

3. Analyze responses to an environmental health concern and identify the types of solutions to that problem (e.g., psychological/social responses; political, legal and economic processes; environmental controls; waste/management).

Standard 3 Technology for Productivity Applications

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 Eight

Understanding Operations

1. Describe how computer and multimedia technology systems work (e.g., asynchronous transfer mode—ATM, Internet protocol—IP, local area networks—LAN, wide area networks—WAN, wireless).

Benchmark B: Select appropriate technology resources to solve problems and support learning.

Grade Eight

Problem-solving

1. Incorporate all available technology tools and resources to research, investigate, solve and present findings in a problem situation.

Productivity Tools

2. Create a video production related to a class activity.

Research Tools

3. Research educational video clips available online for use in class projects (e.g., consider copyright and fair use issues when selecting video clips).

Keyboarding

4. Demonstrate effective keyboarding skills in a word processing environment.

Benchmark C: Use productivity tools to produce creative works, to prepare publications and to construct technology-enhanced models.

Grade Eight

Research Tools

1. Use content-specific tools, software and simulations to support learning, and research societal and educational problems (e.g., economic simulations, city planning simulation, flight simulators, rapid prototyping).

2. Apply technology resources to support personal productivity, and learning throughout the curriculum.

Standard 4 Technology and Communication Applications
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 Eight

Communications

1. Determine audience characteristics that impact the content of the message (e.g., level of understanding, level of interest).

2. Differentiate audience factors that influence the selection of the communication tool (e.g., will the message be communicated to an individual or a small or large group? will the message be communicated more than once?).

3. Examine the connections among message content, context and purpose (e.g., is the content of the message impacted by the context in which the message is given—does the context impact the purpose?).

4. Reconstruct messages with different communication tools and determine if the tool changes the meaning of the message.

Principles of Design

5. Identify and practice the following Universal Design principles that ensure accessibility for all users of communication projects or products:

a. Image size;

b. Alt attributes/tags;

c. Use of tables and frames;

d. Use of style sheets;

e. Formatting;

f. Use of color text legibility and readability; and

g. Fonts, formatting and captioning.

Benchmark B: Develop, publish and present information in a format that is appropriate for content and audience.

Grade Eight

Publication

1. Construct and publish information in printed and electronic form (e.g., printed reports, resumes, brochures, charts and electronic presentations, videos, Web sites).

2. Select appropriate file types (documents, sounds, images, and multimedia) based on communication need.

Evaluation

3. Evaluate information product based on content and audience (e.g., did the information communicate the intended message to the correct audience?).

Benchmark C: Select appropriate technology communication tools and design collaborative interactive projects and activities to communicate with others.

Grade Eight

Principles of Design

1. Design collaborative interactive activities or projects (e.g., online election for school office, survey, data collection).

Use of Communications
2. Disseminate results obtained through collaborative research projects to a larger audience (e.g., post results on a Web page, e-mail to group participants).
3. Select an appropriate communications tool to obtain and share information (e.g., e-mail, chat, message board, video-conferencing, online project).
Evaluation
4. Critique e-mail to determine communication clarity, and consider appropriate operations and etiquette (e.g., reply, reply all, include original message in reply, etc.).

<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 Eight
Evaluating Sources
1. Understand the structure and organization of information sources including key words, subject directory, subject search in a library catalog or search engine.
2. Demonstrate how to determine copyright issues when creating new products:
a. Ask permission to use articles, quotations and graphics;
b. Credit information to be included in the product.
3. Examine two Web sites with opposing viewpoints and describe the objectivity and intent of the author (e.g., candidates in an election, or other public issues).
4. Evaluate the validity of information by comparing information from different sources for accuracy (e.g., what makes the author an expert—is information the same in multiple sources?).
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 Eight
Decide

1. Formulate an essential question to guide the research process.

Find

 2. Identify and evaluate relevant information and select pertinent information found in each source.

Use

3. Analyze information, finding connections that lead to a final information product.

4. Demonstrate how to determine copyright issues when creating new products (e.g., permission to use articles and graphics, credit information to be included).

5. Use a teacher or district designated citation or style manual to credit sources used in work (e.g., MLA style manual, APA Guidelines, or other selected style manuals).

6. Digitize information for archiving and future use (e.g., creating an electronic portfolio of curricular projects).

Check

7. Revise and edit information product.

8. Evaluate final product for its adherence to project requirements (e.g., recognize weaknesses in process and product and find ways to improve).

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

Grade Eight

Internet Concepts

1. Troubleshoot error messages in a Web browser (e.g., verify the address, use refresh and/or stop buttons).

Search Strategies

2. Incorporate Boolean operators in the search process for curricular needs (e.g., know the basic Boolean operators and use them in a search).

3. Compare information found in searches completed on different search engines (directories, spiders, meta crawlers) and discuss differences in how search engines select, rank and display information:

a. Relevancy;

b. Popularity; and

c. Paid placement.

Evaluating Sources

 4. Compare several Web sites on the same topic and evaluate the purpose of each site (e.g., use several sites for a specific curricular need and note whether the sites have similar or conflicting data).

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

Grade Eight

Electronic Resources

1. Select research databases that align with identified information need (e.g., specialized databases on government, science, history, as needed for assignments).

2. Retrieve information in different types of subscription (fee-based) databases to support information for a curricular need.

3. Locate and use advanced search features and appropriate tools such as Boolean operators ("AND" "OR" "NOT") and a thesaurus in an online database.

Standard 6 Design

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 Eight

Universal Design

1. Identify environments or products that are examples of the application of the principles of Universal Design (e.g., equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, size and space for approach and use).

Ergonomic Design

2. Apply ergonomic considerations to a design to maximize a design's ease of use and to minimize product liability (e.g., ergonomic keyboards decrease wrist injury).

Requirements

3. Categorize the requirements for a design as either criteria or constraints.

Optimization and Trade-offs

4. Document compromises involved in design (e.g., cost, material availability).

Design Application

5. Apply a design process to solve a problem in the community (e.g., identify need, research problem, develop solutions, select best solution, build prototype, test and evaluate, communicate, redesign).

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

Grade Eight
Engineering Design
1. Explain how design involves a set of steps that can be performed in different sequences and repeated as needed (e.g., plan - do - study - act, problem analysis - design - coding and debugging - integration - testing and validation, define problem - identify options - identify best solution - plan how to achieve best solution - evaluate results).
2. Identify how modeling, testing, evaluating and modifying are used to transform ideas into practical solutions.
Strength and Materials
3. Test compression, tension and torsion strength of a material or system.
Benchmark C: Understand and apply research, innovation and invention to problem-solving.
Grade Eight
Principles of Design
1. Explain the design axiom that form follows function.
Design Application
 2. Invent a tool to solve a problem.
Optimization and Trade-offs
3. Describe how invention is a process of turning ideas and imagination into devices and systems; and innovation is the process of modifying an existing product or system to improve it.
Technology Assessment
4. Evaluate a variety of creativity-enhancing techniques.
Technology Transfer, Diffusion
5. Describe how inventions can have multiple applications, some not originally intended.
Innovation and Invention
6. Identify the five levels of innovation and describe their characteristics:
a. Apparent or conventional solution;
b. Small invention inside paradigm;
c. Substantial invention inside technology;
d. Invention outside technology; and
e. Discovery.

<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 Eight

Energy and Power

1. Solve a problem involving energy and power systems (e.g., build a roller coaster for marbles, solar vehicles or solar cookers).

2. Explore ways that energy can be used more efficiently (e.g., improved insulation to reduce heat loss, improved aerodynamics to reduce drag, improved engines to increase efficiency).

3. Estimate and measure power consumption and compare estimates to actual measurements (e.g., compare real to the estimated energy bills at home).

Transportation

4. List the processes, such as receiving, holding, storing, loading, moving, unloading, delivering, evaluating, marketing, managing, communicating and using conventions which are necessary for the entire transportation system to operate efficiently.

5. Describe how governmental regulations influence the design and operation of transportation systems (e.g., seatbelts, airbags, noise levels).

6. Describe why it is important for personnel in transportation technology to constantly update their knowledge and skills.

Manufacturing

7. Discuss how chemical technologies can be used in manufacturing processes (e.g., plastics, adhesives, insulation, personal care product).

8. Describe the location and extraction of natural resources that are used in manufacturing processes (e.g., harvesting, drilling and mining).

9. Explain and utilize basic processes in manufacturing systems (e.g., cutting, shaping, assembling, joining (including stitching), finishing, quality control and safety).

10. Organize and implement an enterprise to manufacture a product.

Construction

11. Describe how the selection of designs for structures is based on factors such as building laws and codes, including Americans

with Disabilities Act concerns, style, convenience, cost, climate and function.

12. Explain how the forces of tension, compression, torsion, bending and shear affect the performance of structures.

13. Describe and model the effects of loads and structural shapes on structures.

Benchmark B: Develop an understanding of, and be able to, select and use informational technologies.

Grade Eight

Information and Communication

1. Explain the factors that influence message design (e.g., intended audience, medium, purpose, budget and nature of message).

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

Benchmark C: Develop an understanding of how bio-related technologies have changed over time.

Grade Eight

Medical

1. Relate how vaccines developed for use in immunization require specialized technologies to support/control environments in which a sufficient amount of vaccines are produced.

2. Describe how licensure is an integral part of medical careers.

3. Recognize the need for appropriate models in testing medicines and medical procedures (e.g., medicine testing that developed dosages for adult males but was used for children and females).

4. Describe how technology is used to protect people from disease and illness, but can also aid their spread.

Agriculture and Related Biotechnologies

5. Explain that the development of refrigeration, freezing, dehydration, preservation and irradiation allows for long-term storage of food and reduces the health risks caused by tainted food.

6. Describe why it is important for personnel in agriculture and biotechnologies to constantly update their knowledge and skills.