

# ODE TECHNOLOGY GUIDELINES

## ~GRADE 7~

### **Nature of Technology—Students develop an understanding of technology, its characteristics, scope, core concepts and relationships between technologies and other fields.**

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

- \_\_\_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.

- \_\_\_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.
- \_\_\_3. Identify parameters that may be placed on the development of a product or system (e.g., cost, time, size).
- \_\_\_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).
- \_\_\_5. Infer that malfunctions of any part of a system may affect the function and quality of the system.
- \_\_\_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.

- \_\_\_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.

### **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.**

**Benchmark A:** Analyze technologically responsible 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.

- \_\_\_1. Explain how the development and use of technologies often put environmental and economic concerns in direct competition with one another.
- \_\_\_2. Explain the life-cycle of a typical product or structure.
- \_\_\_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.

- \_\_\_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.

- \_\_\_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's Web 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.

- \_\_\_ 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).

**Technology for Productivity Applications—**  
**Students learn the operations of technology through the usage of technology and productivity tools.**

**Benchmark A:** Demonstrate an understanding of concepts underlying hardware, software and connectivity.

- \_\_\_ 1. Use vocabulary related to computer and multimedia technology systems (e.g., universal serial bus—USB, hubs and switches).
- \_\_\_ 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.

- \_\_\_ 1. Solve problems using all available technologies for inquiry, investigation, analysis and presenting conclusions.
- \_\_\_ 2. Investigate various formats of video content and methods of presentation (e.g., .mpeg, .avi).
- \_\_\_ 3. Edit video clips using video editing software.
- \_\_\_ 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.

- \_\_\_ 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.

**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.

**Benchmark A:** Communicate information technologically and incorporate principles of design into the creation of messages and communication products.

- \_\_\_ 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).
- \_\_\_ 2. Integrate advanced design features into communication products (e.g., background selection, framing, set design).
- \_\_\_ 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.

- \_\_\_ 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);
  - e. Layer or merge images.

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

- \_\_\_ 1. Compose e-mail messages and incorporate advanced techniques (e.g., include attachments, send to multiple recipients, format stationary, manage inbox, create address book).
- \_\_\_ 2. Acquire and disseminate information by participating in virtual learning activities (e.g., Web casts, videoconferencing, distance learning offerings).

**Technology and Information Literacy—**  
**Students engage in information literacy strategies, use the Internet, technology tools and resources, and apply information-management skills to answer questions and expand knowledge.**

**Benchmark A:** Evaluate the accuracy, authority, objectivity, currency, coverage and relevance of information and data 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: developing essential question; identifying resources; selecting, using and analyzing information; synthesizing and generating a product; and evaluate both process and product.

- \_\_\_1. Develop open-ended research questions about a defined information need.
- \_\_\_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-per-use) to meet an information need (e.g., magazine database, picture archive, online encyclopedia).
- \_\_\_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).
- \_\_\_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.

- \_\_\_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).
- \_\_\_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).
- \_\_\_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.

- \_\_\_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).

**Design—Students apply a number of problem-solving strategies demonstrating the nature of design, the role of engineering and the role of assessment.**

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

- \_\_\_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).
- \_\_\_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).
- \_\_\_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?).
- \_\_\_4. Make two- and three-dimensional representations of the designed solution (e.g., 2-D includes sketches, drawings, and computer-aided designs—CAD and

3-D includes graphic, mathematical and physical models).

- \_\_\_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.
- \_\_\_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).
- \_\_\_7. Research and diagram the product development life-cycle of an invention.
- \_\_\_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 Renaissance in Europe).

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

- \_\_\_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.

- \_\_\_1. Explain that understanding the function of an object requires a higher level of thinking than focusing on the object itself.
- \_\_\_2. Describe how some technological problems are best solved through experimentation.
- \_\_\_3. Describe and complete an experiment to evaluate the solution to a problem.
- \_\_\_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?).
- \_\_\_5. Distinguish 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).
- \_\_\_6. Identify the patterns of technological invention

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

**Designed World**—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.

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

- \_\_\_ 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.
- \_\_\_ 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 license, pilot's license).
- \_\_\_ 6. Identify and manipulate the factors that influence vehicle performance (e.g., lift, drag, friction, thrust, pressure and gravity).
- \_\_\_ 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).

- \_\_\_ 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.

- \_\_\_ 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 a 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.

- \_\_\_ 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).

- \_\_\_ 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).