



Technology and Engineering at Delta

I. Introduction – Nature of the Discipline

Technology and engineering are inextricably linked. “Technology – like language, ritual, values, commerce, and the arts – is an intrinsic part of a cultural system and it both shapes and reflects the system’s values.”¹ Engineering is the orchestration of scientific, mathematical, and technological principles to solve problems. Engineering enables the creation of technology and its application. Through the use of technology, people modify the natural world to suit their own purposes².

Technology and engineering will play a central role at Delta High School. Students will understand and respect the potential of technology to transform society and the environment. Given its power, students will need to recognize the ethical implications of technological advancements.³ Delta High School students will practice academic skills gained from core curriculum classes as they develop new technologies, analyze test data, document results, and communicate in the form of written reports, technical drawings, and oral presentations.

II. Overarching Goals and Purposes

Through technology and engineering education, students will understand the relationship between technology and engineering. Students will learn how the development and use of technology has impacted history and will impact the future. Students will consider ethics in developing and applying technological solutions for society’s problems. Students will build the depth and breadth of skills required to address the problems that face their region, nation and world. The future will involve unforeseen challenges as well as new technologies and careers. Students will need to be able to think to solve problems and communicate their thoughts to be prepared for an exciting future. They will need to appreciate the diversity of skills and disciplines needed to develop, debug, and deploy technological solutions to everyday problems.

II. Overarching Goals and Purposes

The technology and engineering curriculum will be aligned with the National Science Education Standards and ITEA's Standards for Technological Literacy. Students will be engaged with relevant problems. The curriculum will focus on the nature and scope of technology and engineering through the following attributes:

- Connects to other curriculum as appropriate and where it has purpose and is not contrived.
- Moves emphasis from teacher-directed to student-directed project-based learning.

The role of technology and engineering at the Delta High School will have multiple purposes. Students will be prepared for a technological world by:

- Learning how to evaluate and apply available technology
- Developing technology
- Solving real world problems
- Considering trade-offs in making decisions
- Developing abilities of innovation and creativity
- Building prototypes and products

Through their experiences, students will develop habits of mind and 21st century skills needed to support their post-secondary goals. These habits of mind and 21st century skills will be emphasized in the following ways:

- Problem solving through the engineering process
- Developing work place qualities through project-based learning
- Building Interpersonal skills through teaming

Through the use of Career and Technology Education, certified educators and community-based experiences, the students will become aware of a range of careers available in technology and engineering and will be prepared to use technology to shape their world.

III. Course Sequence

The first two years of the program of study will emphasize the fundamental concepts and skills of technology and engineering. Learning experiences will be more teacher-directed. During the third year, the program of study will emphasize more advanced concepts and skills. Learning experiences will be more student-directed. In Year 4, students will independently apply what they have learned in previous experiences with the support of a teacher-coach. Students will be able to access community resources (e.g., courses offered by other institutions, internships, or independent research). Years 1

III. Course Sequence

& 2- The Fundamentals of Technology and Engineering (required 2 credits)

- 1 Course Characteristics
 - a) Stand-alone technology and engineering education classes
 - b) Focused on the fundamentals of technology and engineering
 - c) Project Based Learning
 - d) Application of state-of-the-art technology tools
 - e) Connections to university, community, skilled trades, business/industry for real world experiences in order to develop career awareness
- 2 Attributes of the project-based learning
 - a) Projects are intentional and purposeful and focus on the development of fundamental knowledge and skills consistent with the standards
 - b) Projects will be connected to other programs of study (subject matter; courses) where appropriate
 - c) Projects will be more teacher-directed to ensure acquisition of fundamental concepts and skills
- 3 Course Content (ITEA Standards 1-10)
 - a) Principles of technology
 - b) Principles of engineering

Issues in technology and society Year 3 - Solving Real World Problems-Entryway to Capstone Experience (required 1 credit)

- 1 Course characteristics
 - a) Focused technology and engineering education classes with strong connections to the application of knowledge and skills in other disciplines
 - b) Emphasis on advanced technology and engineering concepts and skills
 - c) Project-based learning
 - d) Applies state-of-the-art technology tools
 - e) Connections to university, community, skilled trades, business/industry for real world experiences and to develop career awareness
- 2 Attributes of the project-based learning
 - a) Student-driven and self-directed problems connected to other disciplines
 - b) Projects will involve individual and small-group work; small group work will promote development of teaming skills; and small groups will embrace diversity.
 - c) Projects reflect increasing levels of sophistication

III. Course Sequence

- 3 Course Content (ITEA Standards 8-13)
 - a) Technology and engineering applications

Year 4 – Optional independent study (1 or 2 Credits)

- 1 Course characteristics
 - a) Emphasis on work-based learning to apply advanced technology and engineering concepts and skills
 - b) Will apply state-of-the-art technology tools
 - c) Connections to university, community, skilled trades, business/industry for real world experiences and to increase career awareness
 - d) Course could be used to complete independent research, access courses at other institutions
 - e) Course could be used to complete the Senior Capstone (Culminating) Project
- 2 Attributes of the project-based learning
 - a) Student-driven and self-directed problems
 - b) Projects will involve individual and/or small-group work
 - c) Projects will reflect high level of sophistication and detail.

IV. Big Ideas

The disciplines of technology and engineering deal with the designed world. The designed world consists of all the modifications that humans have made to the natural world to satisfy their own needs and wants. The natural world consists of the things that exist without human intervention or inventions. The social world includes the various mores that humans have devised to govern their interactions and relationships with one another.

The big ideas related to technology and engineering² include:

- Problem-solving – Solving problems is the driver of technological development.
 - Problem-solving includes design, troubleshooting, research and development, invention and innovation, and experimentation.
- Technology and Society – To be understood properly, technology must be put into a social, cultural, and environmental context.
 - Technology affects cultural, social, economic, and political structures and processes.
 - Technology impacts the environment.
 - Society is responsible for the development and ethical use of technology.

- Technology influences history.
- Engineering Process – Engineering is the orchestration of scientific, mathematical, and technological principles to solve problems.
 - Engineering enables the creation or improvement of any product or system.
 - The engineering process demands critical thinking, the application of technical knowledge, creativity, and an appreciation of the effects of a design on society and the environment.
- Decision-making in a Technological World – To make informed decisions, citizens need to know what technology is, how it is developed, how it works, and its impact.
 - Understand the engineering process.
 - Use, maintain, improve, and develop technological products and systems.
 - Assess the impact of products and systems on the natural and social world.

Big ideas are the basis for the technology and engineering curriculum. These ideas also have implications for deepening understanding of the science disciplines, mathematics, and the disciplines embedded within the humanities. Understanding the big ideas of technology and engineering requires that students understand systems and the impact of change as they solve problems in the natural and social world.

V. Cross-Curricular Applications

Cross-curricular applications will be designed around Big ideas that are transferable across other content areas: problem-solving, technology and society, decision-making in a technological world, and the engineering process. Through multiple learning experiences, students will focus on the big ideas within and across the disciplines.

Problem-solving:

- Build the apparatus for a science experiment (Technology and Engineering with Science)
- Design a public facility (Technology and Engineering with Humanities/Science/Mathematics)

Technology and Society:

- Design a solution to a community-based problem such as managing nuclear waste; power generation (Technology and Engineering with Humanities/Science/Mathematics)

Decision-making in a Technological World:

- Debate the ethics of a controversial current issue (Technology and Engineering with Humanities)

Engineering Process:

- Design, build a prototype, and develop the manufacturing process for a new educational toy for venture capitalists (Technology and Engineering with Humanities/Science/Mathematics)

VI. Cornerstone to Capstone Experiences

Senior Capstone Project

- Study, engineer, and communicate a solution to a real-world problem (e.g., systems for salmon recovery, tools to address health issues)
- Work with an inventor, innovator, or engineer to contribute to ongoing research and communicate the results of your study

¹American Association for the Advancement of Science (1990). *Science for All Americans: A Project 2061 Report*, Washington, D.C.: AAAS

²International Technology Education Association (2007). *Standards for Technological Literacy: Content for the Study of Technology*, Reston, VA: ITEA.

³American Association for the Advancement of Science (1993). *Benchmarks for Science*, New York: Oxford University Press.