Standards for Principles of Engineering

Standards for Technological Literacy

***STL* Standard 1:** Students will develop an understanding of the characteristics and scope of technology.

***STL* Standard 2:** Students will develop an understanding of the core concepts of technology.

***STL* Standard 3:** Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.

***STL* Standard 4:** Students will develop an understanding of the cultural, social, economic, and political effects of technology.

***STL* Standard 5:** Students will develop an understanding of the effects of technology on the environment.

***STL* Standard 6:** Students will develop an understanding of the role of society in the development and use of technology.

***STL* Standard 7:** Students will develop an understanding of the influence of technology on history.

***STL* Standard 8:** Students will develop an understanding of the attributes of design.

***STL* Standard 9:** Students will develop an understanding of engineering design.

***STL* Standard 10:** Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

***STL* Standard 11:** Students will develop the abilities to apply the design process.

***STL* Standard 12:** Students will develop the abilities to use and maintain technological products and systems.

***STL* Standard 13:** Students will develop the abilities to assess the impact of products and systems.

***STL* Standard 14:** Students will develop an understanding of and be able to select and use medical technologies.

***STL* Standard 15:** Students will develop an understanding of and be able to select and use agricultural and related biotechnologies.

***STL* Standard 16:** Students will develop an understanding of and be able to select and use energy and power technologies.

***STL* Standard 17:** Students will develop an understanding of and be able to select and use information and communication technologies.

***STL* Standard 18:** Students will develop an understanding of and be able to select and use transportation technologies.

***STL* Standard 19:** Students will develop an understanding of and be able to select and use manufacturing technologies.

***STL* Standard 20:** Students will develop an understanding of and be able to select and use construction technologies.

Source: International Technology Education Association's (ITEA) **Standards for Technological Literacy: Content for the Study of Technology**.

National Science Education Standards

***NSES* Content Standard K-12: Unifying Concepts and Processes**

As a result of activities in grades K-12, all students should develop understanding and abilities aligned with the following concepts and processes—

- Systems, order, and organization
- Evidence, models, and explanation
- Change, constancy, and measurement
- Evolution and equilibrium
- Form and function

***NSES* Content Standard A: Science As Inquiry**

As a result of activities in grades 9-12, all students should develop—

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

***NSES* Content Standard B: Physical Science**

As a result of activities in grades 9-12, all students should develop an understanding of—

- Structure of atoms
- Structure and properties of matter
- Chemical reactions
- Motions and forces
- Conservation of energy and increase in disorder
- Interactions of energy and matter

***NSES* Content Standard C: Life Science**

As a result of activities in grades 9-12, all students should develop an understanding of—

- The cell

- Molecular basis of heredity
- Biological evolution
- Interdependence of organisms
- Matter, energy, and organization in living systems
- Behavior of organisms

***NSES* Content Standard D: Earth and Space Science**

As a result of activities in grades 9-12, all students should develop an understanding of—

- Energy in the earth system
- Geochemical cycles
- Origin and evolution of the earth system
- Origin and evolution of the universe

***NSES* Content Standard E: Science and Technology**

As a result of activities in grades 9-12, all students should develop—

- Abilities of technological design
- Understandings about science and technology

***NSES* Content Standard F: Science in Personal and Social Perspectives**

As a result of activities in grades 9-12, all students should develop understanding of—

- Personal and community health
- Population growth
- Natural resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

***NSES* Content Standard G: History and Nature of Science**

As a result of activities in grades 9-12, all students should develop understanding of—

- Science as a human endeavor
- Nature of scientific knowledge
- Historical perspectives

Source: National Research Council (NRC) National Science Education Standards.

Principles and Standards for School Mathematics

***PSSM* Number Operations Standard:** Instructional programs from pre-kindergarten through grade 12 should enable all students to—

- understand numbers, ways of representing numbers, relationships among numbers, and number systems;
- understand meanings of operations and how they relate to one another;
- compute fluently and make reasonable estimates

***PSSM* Algebra Standard:** Instructional programs from pre-kindergarten through grade 12 should enable all students to—

- understand patterns, relations, and functions;
- represent and analyze mathematical situations and structures using algebraic symbols;
- use mathematical models to represent and understand quantitative relationships;
- **analyze change** in various contexts.

***PSSM* Geometry Standard:** Instructional programs from pre-kindergarten through grade 12 should enable all students to—

- analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships;
- specify locations and describe spatial relationships using coordinate geometry and other representational systems;
- apply transformations and use symmetry to analyze mathematical situations;
- use visualization, spatial reasoning, and geometric modeling to solve problems.

***PSSM* Measurement Standard:** Instructional programs from pre-kindergarten through grade 12 should enable all students to—

- understand measurable attributes of objects and the units, systems, and processes of measurement;
- apply appropriate techniques, tools, and formulas to determine measurements.

***PSSM* Data Analysis and Probability Standard:** Instructional programs from pre-kindergarten through grade 12 should enable all students to—

- formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them;
- select and use appropriate statistical methods to analyze data;
- develop and evaluate inferences and predictions that are based on data;
- understand and apply basic concepts of probability.

***PSSM* Problem Solving Standard:** Instructional programs from pre-kindergarten through grade 12 should enable all students to—

- build new mathematical knowledge through problem solving;
- solve problems that arise in mathematics and in other contexts;
- apply and adapt a variety of appropriate strategies to solve problems;
- monitor and reflect on the process of mathematical problem solving.

***PSSM* Reasoning and Proof Standard:** Instructional programs from pre-kindergarten through grade 12 should enable all students to—

- recognize reasoning and proof as fundamental aspects of mathematics;
- make and investigate mathematical conjectures;
- **develop and evaluate** mathematical arguments and proofs;
- select and use various types of reasoning and methods of proof.

***PSSM* Communication Standard:** Instructional programs from pre-kindergarten through grade 12 should enable all students to—

- organize and consolidate their mathematical thinking through communication;
- communicate their mathematical thinking coherently and clearly to peers, teachers, and others;
- analyze and evaluate the mathematical thinking and strategies of others;
- use the language of mathematics to express mathematical ideas precisely

***PSSM* Connections Standard:** Instructional programs from pre-kindergarten through grade 12 should enable all students to—

- recognize and use connections among mathematical ideas;
- understand how mathematical ideas interconnect and build on one another to produce a coherent whole;
- recognize and apply mathematics in contexts outside of mathematics.

***PSSM* Representation Standard:** Instructional programs from pre-kindergarten through grade 12 should enable all students to—

- create and use representations to organize, record, and communicate mathematical ideas;
- select, apply, and translate among mathematical representations to solve problems;
- use representations to model and interpret physical, social, and mathematical phenomena.

Source: National Council of Teachers of Mathematics (NCTM) ***Principles and Standards for School Mathematics***.

Standards for the English Language Arts

***SELA* Standard 1:** Students read a wide range of print and non-print texts to build an understanding of texts of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classical and contemporary works.

***SELA* Standard 2:** Students read a wide range of literature from many periods in many genres to build an understanding of the many dimensions (e.g. philosophical, ethical, aesthetic) of human experience.

***SELA* Standard 3:** Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and other texts, their word identification strategies, and their understanding of textual features (e.g. sound-letter correspondence, sentence structure, context, graphics).

***SELA* Standard 4:** Students adjust their use of spoken, written, and visual language (e.g. conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

***SELA* Standard 5:** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences and for a variety of purposes.

***SELA* Standard 6:** Students apply knowledge of language structure, language conventions (e.g. spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts.

***SELA* Standard 7:** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g. print and non-print texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.

***SELA* Standard 8:** Students use a variety of technological and informational resources (e.g. libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

***SELA* Standard 9:** Students develop an understanding of and respect for diversity in language use, patterns, and dialects across cultures, ethnic groups, geographic regions, and social roles.

***SELA* Standard 10:** Students whose first language is not English make use of their first language to develop competency in English language arts and to develop understanding of content across social roles.

***SELA* Standard 11**: Students participate as knowledgeable reflective, creative, and critical members of a variety of literacy communities.

***SELA* Standard 12:** Students use spoken, written and visual language to accomplish their own purposes (e.g. for learning, enjoyment, persuasion, and the exchange of information).

Source: National Council of Teachers of English (NCTE) and International Reading Association (IRA) ***Standards for English Language Arts***.