Pre-Engineering Evaluation Tool

2020 Curricular Materials Review

Idaho Engineering and Technology Education (ETE) Pre-Engineering Program Standards[[1]](#footnote-1)

**Publisher information**

* Publisher Name:
* Title:
* Grade Level:
* ISBN #:
* Author:
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# Instructions:

Complete the Publisher Standards Alignment Report below. Please provide written justification as to how the material meets the standard along with location references. If a justification requires additional space, please submit response on an additional document.

# Publisher STANDARDS ALIGNMENT Report:

## Standard PENG.1.0: Organization and Safety Procedures

### Performance Standard PENG.1.1 General Lab Safety Rules and Procedures

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.1.1.1 Describe general shop safety rules and procedures. |  |
| CTE PENG.1.1.2 Demonstrate knowledge of OSHA and its role in workplace safety. |  |
| CTE PENG.1.1.3 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities (i.e., personal protection equipment – PPE). |  |
| CTE PENG.1.1.4 Operate lab equipment according to safety guidelines. |  |
| CTE PENG.1.1.5 Identify and use proper lifting procedures and proper use of support equipment. |  |
| CTE PENG.1.1.6 Utilize proper ventilation procedures for working within the lab/shop area. |  |
| CTE PENG.1.1.7 Identify marked safety areas and safety signage. |  |
| CTE PENG.1.1.8 Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment. |  |
| CTE PENG.1.1.9 Identify the location and use of eye wash stations. |  |
| CTE PENG.1.1.10 Identify the location of the posted evacuation routes. |  |
| CTE PENG.1.1.11 Identify and wear appropriate clothing for lab/shop activities. |  |
| CTE PENG.1.1.12 Secure hair and jewelry for lab/shop activities. |  |
| CTE PENG.1.1.13 Understand knowledge of the safety aspects of low and high voltage circuits. |  |
| CTE PENG.1.1.14 Locate and interpret safety data sheets (SDS). |  |
| CTE PENG.1.1.15 Perform housekeeping duties. |  |
| CTE PENG.1.1.16 Follow verbal instructions to complete work assignments. |  |
| CTE PENG.1.1.17 Follow written instructions to complete work assignments. |  |

### Performance Standard PENG.1.2 Hand Tools

|  |  |
| --- | --- |
| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| CTE PENG.1.2.1 Identify hand tools and their appropriate usage. |  |
| CTE PENG.1.2.2 Identify standards and metric designation. |  |
| CTE PENG.1.2.3 Demonstrate the proper techniques when using hand tools. |  |
| CTE PENG.1.2.4 Demonstrate safe handling and use of appropriate tools. |  |
| CTE PENG.1.2.5 Identify proper cleaning, storage and maintenance of tools. |  |

### Performance Standard PENG.1.3 Power Tools and Equipment

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.1.3.1 Identify power tools and their appropriate usage. |  |
| CTE PENG.1.3.2 Identify equipment and their appropriate usage. |  |
| CTE PENG.1.3.3 Demonstrate the proper techniques when using power tools and equipment. |  |
| CTE PENG.1.3.4 Demonstrate safe handling and use of appropriate power tools and equipment. |  |
| CTE PENG.1.3.5 Identify proper cleaning, storage and maintenance of power tools and equipment. |  |

## Standard PENG.2.0: Impact of Engineering

### Performance Standard PENG.2.1 Engineering History

|  |  |
| --- | --- |
| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| CTE PENG.2.1.1 Define engineering. |  |
| CTE PENG.2.1.2 Identify engineering achievements throughout history. |  |
| CTE PENG.2.1.3 Research how historical period and regional style have influenced engineering design. |  |
| CTE PENG.2.1.4 Investigate the evolution of a product. |  |

### Performance Standard PENG.2.2 Engineering Careers

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.2.2.1 Investigate engineering careers, training, and associated opportunities. |  |
| CTE PENG.2.2.2 Describe the difference between engineering disciplines and job functions. |  |
| CTE PENG.2.2.3 Explore career opportunities and list the educational requirements for a given engineering field. |  |
| CTE PENG.2.2.4 Describe the importance of engineering teams. |  |
| CTE PENG.2.2.5 Differentiate the careers associated with associates degrees, bachelor degrees, and master plus degrees. |  |

### Performance Standard PENG.2.3 Ethics in Engineering

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.2.3.1 Knowledge of current professional engineering codes of ethics. |  |
| CTE PENG.2.3.2 Knowledge of ethical engineering issues. |  |
| CTE PENG.2.3.3 Apply and explain how ethical and technical issues contribute to an engineering disaster. |  |
| CTE PENG.2.3.4 Describe how ethics influence the engineering process. |  |

## Standard PENG.3.0: Engineering Design Process

### Performance Standard PENG.3.1 Design Process

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.3.1.1 Identify and understand the common elements of a design process, including define the problem, generate concepts, develop a solution, develop a design proposal, construct and test a prototype, refine the design, evaluate a solution and communicate the processes and results. |  |
| CTE PENG.3.1.2 Apply the steps of the design process to solve a design problem. |  |
| CTE PENG.3.1.3 Describe how social, environmental, and financial constraints influence the design process. |  |
| CTE PENG.3.1.4 Diagram the lifecycle of a product. |  |

## Standard PENG.4.0: Engineering Documentation

### Performance Standard PENG.4.1 Freehand Technical Sketching Techniques

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.4.1.1 Develop design ideas using freehand sketching. |  |
| CTE PENG.4.1.2 Identify the six primary orthographic views. |  |
| CTE PENG.4.1.3 Create pictorial and multi-view sketches. |  |
| CTE PENG.4.1.4 Utilize the alphabet of lines (i.e., styles and weights) and/or line conventions. |  |
| CTE PENG.4.1.5 Legibly annotate sketches. |  |

### Performance Standard PENG.4.2 Measuring and Scaling Techniques

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.4.2.1 Identify industry standard units of measure. |  |
| CTE PENG.4.2.2 Convert between industry standard units of measure. |  |
| CTE PENG.4.2.3 Determine appropriate engineering and metric scales. |  |
| CTE PENG.4.2.4 Measure speed, distance, object size, area, mass, volume, and temperature. |  |
| CTE PENG.4.2.5 Determine and apply the equivalence between fractions and decimals. |  |
| CTE PENG.4.2.6 Demonstrate proper use of precision measuring tools. |  |

### Performance Standard PENG.4.3 Engineering Documentation Procedures

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.4.3.1 Demonstrate record keeping procedures and communication in engineering. |  |
| CTE PENG.4.3.2 Identify the importance of proprietary documentation in engineering. |  |
| CTE PENG.4.3.3 Understand the copyright and patent process. |  |
| CTE PENG.4.3.4 Illustrate project management timelines. |  |
| CTE PENG.4.3.5 Create a written technical report. |  |

### Performance Standard PENG.4.4 Technical Drawings

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.4.4.1 Interpret basic elements of a technical drawing (i.e., title block information, dimensions, and line types). |  |
| CTE PENG.4.4.2 Produce drawings from sketches. |  |
| CTE PENG.4.4.3 Identify industry standard symbols. |  |
| CTE PENG.4.4.4 Describe and construct various types of drawings (i.e., part, assembly, pictorial, orthographic, isometric, and schematic) using proper symbols. |  |
| CTE PENG.4.4.5 Construct drawings utilizing metric and customary (i.e., SAE and Imperial) measurement systems. |  |
| CTE PENG.4.4.6 Arrange dimensions and annotations using appropriate standards (i.e., ANSI and ISO). |  |
| CTE PENG.4.4.7 Construct bill of materials or schedule. |  |

### Performance Standard PENG.4.5 Modeling Techniques

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.4.5.1 Identify the areas of modeling (i.e., physical, conceptual, and mathematical). |  |
| CTE PENG.4.5.2 Create a scale model or working prototype. |  |
| CTE PENG.4.5.3 Evaluate a scale model or a working prototype. |  |

## Standard PENG.5.0: Material Properties

### Performance Standard PENG.5.1 Material Properties and Science

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.5.1.1 Identify the major material families used in manufacturing. |  |
| CTE PENG.5.1.2 Differentiate between the various types of material properties and their applications. |  |
| CTE PENG.5.1.3 Discuss the impact of material usage on the environment. |  |
| CTE PENG.5.1.4 Explain how cost in production is affected by the availability, quality, and quantity of resources. |  |
| CTE PENG.5.1.5 Differentiate among raw material standard stock and finished products. |  |

### Performance Standard PENG.5.2 Materials Strength

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.5.2.1 Describe the various forms of stress (i.e., compression, tension, torque, and shear). |  |
| CTE PENG.5.2.2 Recognize and describe a stress strain curve. |  |
| CTE PENG.5.2.3 Create free body diagrams of objects, identifying all forces acting on the object. |  |
| CTE PENG.5.2.4 Differentiate between scalar and vector quantities. |  |
| CTE PENG.5.2.5 Understand magnitude, direction, and sense of a vector. |  |
| CTE PENG.5.2.6 Understand moment and torque forces. |  |

## Standard PENG.6.0: Fundamental Power Systems and Energy Principles

### Performance Standard PENG.6.1 Power Systems and Energy Forms

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.6.1.1 Define terms used in power systems (e.g., power, work, horsepower, watts, etc.). |  |
| CTE PENG.6.1.2 Identify the basic power systems. |  |
| CTE PENG.6.1.3 List the basic elements of power systems. |  |
| CTE PENG.6.1.4 Summarize the advantages and disadvantages of various forms of power. |  |
| CTE PENG.6.1.5 Calculate the efficiency of power systems and conversion devices. |  |
| CTE PENG.6.1.6 Define energy. |  |
| CTE PENG.6.1.7 Define potential energy and kinetic energy. |  |
| CTE PENG.6.1.8 Identify forms of potential energy and kinetic energy. |  |
| CTE PENG.6.1.9 Categorize types of energy into major forms such as, thermal, radiant, nuclear, chemical, electrical, mechanical, and fluid. |  |
| CTE PENG.6.1.10 Identify units used to measure energy. |  |
| CTE PENG.6.1.11 Analyze and apply data and measurements to solve problems and interpret documents. |  |
| CTE PENG.6.1.12 Calculate unit conversions between common energy measurements. |  |
| CTE PENG.6.1.13 Demonstrate an energy conversion device. |  |

### Performance Standard PENG.6.2 Basic Mechanical Systems

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.6.2.1 Distinguish between the six simple machines, their attributes, and components. |  |
| CTE PENG.6.2.2 Measure forces and distances related to mechanisms. |  |
| CTE PENG.6.2.3 Determine efficiency in a mechanical system. |  |
| CTE PENG.6.2.4 Calculate mechanical advantage and drive ratios of mechanisms. |  |
| CTE PENG.6.2.5 Calculate work, power, torque and/or moments. |  |
| CTE PENG.6.2.6 Design, construct, and test various basic mechanical systems. |  |

### Performance Standard PENG.6.3 Energy Sources and Applications

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.6.3.1 Identify and categorize energy sources as nonrenewable, renewable, or inexhaustible. |  |
| CTE PENG.6.3.2 Define the possible types of power conversion. |  |
| CTE PENG.6.3.3 Measure circuit values using a multimeter. |  |
| CTE PENG.6.3.4 Calculate power in a system that converts energy from electrical to mechanical. |  |
| CTE PENG.6.3.5 Determine efficiency of a system that converts an electrical input to a mechanical output. |  |
| CTE PENG.6.3.6 Compute values of current, resistance, and voltage using Ohm’s law. |  |
| CTE PENG.6.3.7 Solve series and parallel circuits using basic laws of electricity including Kirchhoff’s laws. |  |
| CTE PENG.6.3.8 Test and apply the relationship between voltage, current, and resistance relating to a photovoltaic cell and a hydrogen fuel cell. |  |

### Performance Standard PENG.6.4 Machine Control Systems

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.6.4.1 Create detailed operational flowcharts. |  |
| CTE PENG.6.4.2 Create system control programs (i.e., sequential, logic). |  |
| CTE PENG.6.4.3 Select appropriate input and output devices based on system specifications and constraints. |  |
| CTE PENG.6.4.4 Differentiate between the characteristics of digital and analog devices. |  |
| CTE PENG.6.4.5 Compare and contrast open and closed loop systems. |  |
| CTE PENG.6.4.6 Design and create a control system based on specifications and constraints. |  |

### Performance Standard PENG.6.5 Basic Fluid Systems

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.6.5.1 Define fluid systems (e.g., hydraulic, pneumatic, vacuum, etc.). |  |
| CTE PENG.6.5.2 Identify and define the components of fluid systems. |  |
| CTE PENG.6.5.3 Compare and contrast hydraulic and pneumatic systems. |  |
| CTE PENG.6.5.4 Identify the advantages and disadvantages of using fluid power systems. |  |
| CTE PENG.6.5.5 Explain the difference between gauge pressure and absolute pressure. |  |
| CTE PENG.6.5.6 Discuss the safety concerns of working with liquids and gases under pressure. |  |
| CTE PENG.6.5.7 Calculate mechanical advantage using Pascal’s law. |  |
| CTE PENG.6.5.8 Calculate values in a pneumatic system using the ideal gas laws. |  |

## Standard 7.0: Statistics and Kinematic Principles

### Performance Standard PENG.7.1 Statistics

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.7.1.1 Define statistical terminology. |  |
| CTE PENG.7.1.2 Create a histogram to illustrate frequency distribution. |  |
| CTE PENG.7.1.3 Calculate the central tendency of a data array to include mean, median, and mode. |  |
| CTE PENG.7.1.4 Calculate data variation to include range, standard deviation, and variance. |  |

### Performance Standard PENG.7.2 Kinematic Principles

| Student Competencies by Performance Standard | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| CTE PENG.7.2.1 Define kinematic terminology. |  |
| CTE PENG.7.2.2 Calculate distance, displacement, speed, velocity, and acceleration based on specific data. |  |

# Indicators of quality Rubric:

Standards aligned and Integrated Curriculum:

| Standards | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| 1. The curriculum is based on industry-validated technical standards and competencies. |  |
| 1. The curriculum is aligned with relevant content and standards for core subjects, such as reading, math and science, including federal, state and/or local standards, as appropriate. |  |
| 1. The curriculum incorporates employability skill standards that help students succeed in the workplace, such as problem solving, critical thinking, teamwork, communications and workplace etiquette. |  |
| 1. The curriculum allows for student application of integrated knowledge and skills in authentic scenarios. |  |
| 1. Materials used reflect current workplace, industry and/or occupational practices and requirements. |  |

Access and Equity:

| Standards | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| 1. Materials are provided in a way that ensures all students have the opportunity to achieve success in the program of study, including by meeting Title IX, Americans with Disabilities Act and other accessibility requirements. |  |
| 1. Materials and assessments are free from bias, inclusive and non-discriminatory, and offered in a way that ensures all students have the opportunity to achieve success in the program of study. |  |
| 1. Contains guidance to support differentiated and culturally responsive (i.e., purposefully represents diverse cultures, linguistic backgrounds, learning styles and interests) instruction in the classroom so that every student’s need are addressed by including:    1. Suggestions for how to promote equitable instruction by making connections to culture, home, neighborhood, and community as appropriate.    2. Appropriate scaffolding, interventions, and supports, including integrated and appropriate reading, writing, listening, and speaking alternatives (e.g., translations, picture support, graphic organizers) that neither sacrifice content nor avoid language development for English language learners, special needs, or below grade level readers.    3. Digital and print resources that provide various levels of readability.    4. Modifications and extensions for all students, including those performing above their grade level, to deepen understanding of the content.    5. Materials in multiple language formats. |  |

Student Focus:

| Standards | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| 1. The material supports the sequential and cumulative development of foundational skills and progresses in specificity to build students’ depth of knowledge and skills. Those skills are necessary for a student’s independent comprehension of grade-level complex texts and mastery of tasks called for by the standards. |  |
| 1. Content and standards within the program of study are non-duplicative and vertically aligned to prepare students to transition seamlessly to the next level of education. |  |
| 1. The material provides many and varied opportunities for students to work with each standard within the grade level. |  |
| 1. The material cross-refers and integrates other content areas. |  |
| 1. The material has a balance of text types and lengths that encourage close, in-depth reading and rereading, analysis, comparison, and synthesis of texts. |  |
| 1. The material includes sufficient supplementary activities or assignments that are appropriately integrated into the text. |  |
| 1. The material has activities and assignments that develop problem-solving skills and foster synthesis and inquiry at both an individual and group level. |  |
| 1. The material has activities and assignments that reflect varied learning styles of students. |  |
| 1. The material includes appropriate instructional strategies. |  |
| 1. Project-based learning and related instructional approaches, such as problem-based, inquiry-based and challenge-based learning, are fully integrated into the material. |  |

Pedagogical Approach:

| Standards | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| 1. Provides guidance for teachers throughout for how learning experiences build on each other to support students in developing a deep understanding of the content. |  |
| 1. Provides scaffolded supports for teachers to facilitate learning of the content so that students are increasingly responsible for making sense of the content. |  |
| 1. The material provides opportunities for supporting English language learners to regularly and actively participate with grade-level text. |  |
| 1. The material gives clear and concise instruction to teachers and students. It is easy to navigate and understand. |  |
| 1. Includes appropriate academic and content-specific vocabulary in the context of the learning experience that is accessible, introduced, reinforced, reviewed, and augmented with visual representations when appropriate. |  |
| 1. Allows teachers to access, revise, and print form digital resources (e.g., readings, labs, assessments, rubrics). |  |
| 1. Uses varied modes (selected, constructed, project-based, extended response, and performance tasks) of instruction-embedded pre-, formative, summative, peer, and, self-assessment measures of learning. |  |
| 1. Includes editable and aligned rubrics, scoring guidelines, and exemplars that provide guidance for assessing student performance and to support teachers in planning instruction and providing ongoing feedback to students. |  |
| 1. Provides multiple opportunities for students to demonstrate and receive feedback on performance of practices connected with their understanding of concepts. |  |

Presentation and Design:

| Standards | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| 1. The material has an aesthetically appealing appearance. |  |
| 1. Digital and print materials are consistently formatted, visually focused, and uncluttered for efficient use. |  |
| 1. The material has a reasonable and appropriate balance between text and illustration. The material has grade-appropriate font size. |  |
| 1. The illustrations clearly cross-reference the text, are directly relevant to the content (not simply decorative), and promote thinking, discussion, and problem solving. |  |
| 1. Non-text content (performance clips, images, maps, globes, graphs, pictures, charts, databases, and models) are accurate and well integrated into the text. |  |

Technology:

| Standards | Justification: Provide examples from materials as evidence to support each response for this section. Provide descriptions, not just page numbers. |
| --- | --- |
| 1. Technology and digital media support, extend, and enhance learning experiences. |  |
| 1. The material has “platform neutral” technology (i.e., cloud based) and availability for networking. |  |
| 1. The material has a user-friendly and interactive interface allowing the user to control (shift among activities). |  |

For Questions Contact

Content & Curriculum

Idaho State Department of Education

650 W State Street, Boise, ID 83702

208 332 6800 | [www.sde.idaho.gov](http://www.sde.idaho.gov/)

1. [Idaho ETE Pre-Engineering Program Standards](https://cte.idaho.gov/wp-content/uploads/2018/03/Pre-Engineering-Program-Standards..pdf) [↑](#footnote-ref-1)