Electronics Technology Evaluation Tool

2020 Curricular Materials Review

Idaho CTE Trades and Industry (T&I) Electronics Technology 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 ETRC.1.0: Safety and Tools

### Performance Standard ETRC.1.1 Demonstrate 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 ETRC.1.1.1 Describe the physiological reactions electrical shock causes; list various degrees of current the human body can tolerate. |  |
| CTE ETRC.1.1.2 Describe the roles of OSHA in the workplace. |  |
| CTE ETRC.1.1.3 Identify and use proper lifting procedures and proper use of support equipment. |  |
| CTE ETRC.1.1.4 Utilize proper ventilation procedures for working within the lab/shop area. |  |
| CTE ETRC.1.1.5 Identify marked safety areas. |  |
| CTE ETRC.1.1.6 Describe the type and usage of the fire extinguishers. |  |
| CTE ETRC.1.1.7 Identify the location of the posted evacuation routes. |  |
| CTE ETRC.1.1.8 Explain eye and ear protection needed by technicians, and appropriate clothing for lab/shop activities. |  |
| CTE ETRC.1.1.9 Explain the concepts of First Aid and its particular importance to workers in electronic and electronics fields; explain precautions for untrained people. |  |
| CTE ETRC.1.1.10 Describe fusing and circuit breaker rules and reasons for different types of fuses. |  |
| CTE ETRC.1.1.11 Explain how electrostatic discharge (ESD) damages sensitive electronic components. |  |
| CTE ETRC.1.1.12 Demonstrate proper procedures for preventing damage from ESD (ground straps, mats, etc.). |  |

### Performance Standard ETRC.1.2 Identify and Safely Utilize 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 ETRC.1.2.1 Identify the appropriate usage of tools and equipment. |  |
| CTE ETRC.1.2.2 Demonstrate the proper techniques when using tools and equipment. |  |
| CTE ETRC.1.2.3 List tools hazards that are associated with technician activities in the workplace and in the field. |  |
| CTE ETRC.1.2.4 Demonstrate proper cleaning, storage, and maintenance of tools and equipment. |  |
| CTE ETRC.1.2.5 Identify meter protection, safety, and usage. |  |
| CTE ETRC.1.2.6 Explain care of equipment and test leads. |  |
| CTE ETRC.1.2.7 List the purposes and types of signal generators. |  |
| CTE ETRC.1.2.8 Describe meter loading and precautions.  |  |
| CTE ETRC.1.2.9 Describe oscilloscope usage; explain the purpose of each front panel control. |  |

## Standard ETRC.2.0: Electronic Theory

### Performance Standard ETRC.2.1 Explain the Principles of Electronic Theory

| 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 ETRC.2.1.1 Describe the atomic structure, the components of the atom, their charges and importance to electronics technology. |  |
| CTE ETRC.2.1.2 Explain the characteristics of voltage, current, and resistance (unit of measure, letter/symbol). |  |
| CTE ETRC.2.1.3 Explain basic uses for electricity. |  |
| CTE ETRC.2.1.4 Describe the basic methods of using electricity to operate a motor and how to mechanical motion causes a generator to produce electrical current. |  |
| CTE ETRC.2.1.5 List different types of resistive materials and how resistors are used in electronics. |  |
| CTE ETRC.2.1.6 Describe the purposes of capacitors. List common types and construction designs |  |
| CTE ETRC.2.1.7 Explain how inductance relates to magnetism and describe coil construction, cores, and usages. |  |
| CTE ETRC.2.1.8 Compare impedance with reactance and resistance, and describe current/voltage relationships. |  |
| CTE ETRC.2.1.9 List voltage sources, AC and DC, batteries, and natural generation (solar, wind, hydro, etc.). |  |
| CTE ETRC.2.1.10 List Ohms law formulas for current, voltage, resistance, and power. Solve math problems utilizing each. |  |
| CTE ETRC.2.1.11 Calculate power consumption and its effects on circuit design. |  |

### Performance Standard ETRC.2.2 Utilize Schematics and Block Diagrams

| 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 ETRC.2.2.1 Draw and interpret common electrical/electronic symbols. |  |
| CTE ETRC.2.2.2 Explain how block diagrams are used for troubleshooting and maintenance of electronics products. |  |
| CTE ETRC.2.2.3 Explain the differences between wiring prints, schematics, and block diagrams. |  |
| CTE ETRC.2.2.4 Describe the purpose and use of test points. |  |
| CTE ETRC.2.2.5 Explain how schematics are used to locate component and wiring failures in electronics products. |  |
| CTE ETRC.2.2.6 Explain the methods of using flow diagrams/charts. |  |
| CTE ETRC.2.2.7 Explain how block diagrams are used for troubleshooting and maintenance of electronics products. |  |

### Performance Standard ETRC.2.3 Identify Basic Wiring 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 ETRC.2.3.1 List wire types and construction. |  |
| CTE ETRC.2.3.2 List American wire gauges used for various purposes. |  |
| CTE ETRC.2.3.3 Explain the effects of proper and improper termination. |  |
| CTE ETRC.2.3.4 Explain the purposes of grounding and common conventions used in electrical systems and electronics. |  |

## Standard ETRC.3.0: Electronics Components

### Performance Standard ETRC.3.1 Identify Electronic Components

| 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 ETRC.3.1.1 Illustrate schematic symbols for various types of electrical and electronic components. |  |
| CTE ETRC.3.1.2 Recognize the effects of environmental conditions on electronic components. |  |
| CTE ETRC.3.1.3 Identify capacitor types; list common usages; methods of varying capacitance and explain the terms charge and coulomb. |  |
| CTE ETRC.3.1.4 Identify inductor types and reasons for various core materials; how diameter and wire size affects inductance. |  |
| CTE ETRC.3.1.5 Identify common types of transformers and list uses for each; explain step up/down voltage methods; explain why laminations are used. |  |
| CTE ETRC.3.1.6 List common optical devices (LEDs, LCDs, etc.) and describe how a photovoltaic cell is activated. Draw symbols for photo resistors, photodiodes, and phototransistors; list materials from which these devices are made. |  |

### Performance Standard ETRC.3.2 Analyze quantities utilized in electronics

| 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 ETRC.3.2.1 Identify and utilize the basic units of electronic measurements. |  |
| CTE ETRC.3.2.2 Express and convert numbers in scientific, engineering, and metric notation. |  |
| CTE ETRC.3.2.3 Convert from scientific notation to engineering notation. |  |
| CTE ETRC.3.2.4 Identify resistor values from color code or other marks and list composition and reasons for different usages. |  |

## Standard ETRC.4.0: DC and AC Circuit Configuration

### Performance Standard ETRC.4.1 Analyze Series Circuit Configuration

| 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 ETRC.4.1.1 Identify series circuit configuration. |  |
| CTE ETRC.4.1.2 Calculate voltage drops in a series circuit.  |  |
| CTE ETRC.4.1.3 Utilize Kirchhoff’s Voltage Law. |  |
| CTE ETRC.4.1.4. Recognize polarity in a series circuit. |  |
| CTE ETRC.4.1.5 Calculate voltage, current, resistance, and power in a series circuit. |  |
| CTE ETRC.4.1.6 Construct, measure, and analyze simple series circuits. |  |

### Performance Standard ETRC.4.2 Analyze Parallel Circuit Configuration

| 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 ETRC.4.2.1 Identify parallel circuit configuration. |  |
| CTE ETRC.4.2.2 Calculate voltage drops in a parallel circuit. |  |
| CTE ETRC.4.2.3 Utilize Kirchhoff's Current Law. |  |
| CTE ETRC.4.2.4 Recognize polarity in a parallel circuit. |  |
| CTE ETRC.4.2.5 Calculate voltage, current, resistance, and power in a parallel circuit. |  |
| CTE ETRC.4.2.6 Construct, measure, and analyze simple parallel circuits. |  |

### Performance Standard ETRC.4.3 Analyze Series-Parallel Circuit Configuration

| 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 ETRC.4.3.1 Identify series-parallel circuit configuration. |  |
| CTE ETRC.4.3.2 Calculate voltage drops in a series-parallel circuit. |  |
| CTE ETRC.4.3.3 Utilize Kirchhoff's Voltage and Current Laws where appropriate. |  |
| CTE ETRC.4.3.4 Recognize polarity in a series-parallel circuit. |  |
| CTE ETRC.4.3.5 Calculate voltage, current, resistance, and power in a series-parallel circuit. |  |
| CTE ETRC.4.3.6 Utilize Thevenin’s and Norton’s theorems. |  |

### Performance Standard ETRC.4.4 Analyze Alternating Circuits (AC)

| 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 ETRC.4.4.1 Construct and test AC circuits. |  |
| CTE ETRC.4.4.2 Identify AC wave form characteristics: effective voltage (RMS), average voltage, negative alternation, positive alternation, wavelength, amplitude, period, and frequency. |  |
| CTE ETRC.4.4.3 Calculate peak, peak-to-peak, RMS, and average voltage values for an AC waveform. |  |
| CTE ETRC.4.4.4 Explain cycle, hertz, phase, and frequency. |  |
| CTE ETRC.4.4.5 Describe the requirement for inductance in AC electrical circuits (self and mutual inductance). |  |
| CTE ETRC.4.4.6 Compare and contrast reactance, resistance, and impedance. |  |
| CTE ETRC.4.4.7 Explain phase relationships for series, and series- parallel RL, RC, and RCL circuits. |  |
| CTE ETRC.4.4.8 Analyze high and low pass filter circuits. |  |

## Standard ETRC.5.0: Digital Electronic Principles

### Performance Standard ETRC.5.1 Analyze Digital Concepts Design and Circuitry

| 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 ETRC.5.1.1 Identify and convert numbers between numbering systems (decimal, binary, hexadecimal, BCD). |  |
| CTE ETRC.5.1.2 Compare and contrast between 1 (high) and 0 (low or ground). |  |
| CTE ETRC.5.1.3 Perform numerical calculations in numbering systems (binary, hexadecimal, octal). |  |
| CTE ETRC.5.1.4 Identify and describe basic logic operations (AND, OR, buffer, inverter, NAND). |  |
| CTE ETRC.5.1.5 Explain Boolean Algebra and its use in digital circuitry. |  |
| CTE ETRC.5.1.6 Utilize Karnaugh Maps. |  |
| CTE ETRC.5.1.7 Interpret data sheet information.  |  |
| CTE ETRC.5.1.8 Evaluate logic circuit truth tables. |  |
| CTE ETRC.5.1.9 Analyze clock and timing circuit operations. |  |
| CTE ETRC.5.1.10 Analyze combinational logic circuits for a given application (relay logic). |  |
| CTE ETRC.5.1.11 Assess the operation of analog-to-digital and digital-to-analog convertors. |  |
| CTE ETRC.5.1.12 Describe ASCII code. |  |
| CTE ETRC.5.1.13 List the uses and precautions for logic test probes. |  |
| CTE ETRC.5.1.14 Explain how logic pulsers are used. |  |

### Performance Standard ETRC.5.2 Utilize Microcontroller Devices

| 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 ETRC.5.2.1 Describe basic principles of microcontrollers. |  |
| CTE ETRC.5.2.2 Describe the process of executing instructions in a microcontroller. |  |
| CTE ETRC.5.2.3 Draw a flowchart for a typical program or process. |  |
| CTE ETRC.5.2.4 Describe the procedure for instruction coding and program debugging. |  |
| CTE ETRC.5.2.5 Describe the fundamental principles for microcontroller interfacing. |  |
| CTE ETRC.5.2.6 Demonstrate basic wiring procedures for microcontrollers. |  |
| CTE ETRC.5.2.7 Write, deploy, and test an original microcontroller program. |  |

## Standard ETRC.6.0: Soldering and De-soldering Techniques

### Performance Standard ETRC.6.1 Apply Soldering 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 ETRC.6.1.1 Describe solder safety as it pertains to burns and potential fires, damage to facilities or customer products. |  |
| CTE ETRC.6.1.2 Explain the causes of solder fumes and the effects of lead poisoning. |  |
| CTE ETRC.6.1.3 List causes and precautions to prevent or reduce solder splatter. |  |
| CTE ETRC.6.1.4 Explain the reasons for flux usage and describe types. |  |
| CTE ETRC.6.1.5 List types of solder and reasons for choosing each. |  |
| CTE ETRC.6.1.6 Explain heat sinks, why and how they are used.  |  |
| CTE ETRC.6.1.7 Identify cold solder joints and explain causes. |  |
| CTE ETRC.6.1.8 Describe the difference between good and bad mechanical and electrical solder connections. |  |
| CTE ETRC.6.1.9 Demonstrate proper care of solder-desolder equipment and aids. |  |
| CTE ETRC.6.1.10 Demonstrate proper soldering techniques for through-hole and surface mount components. |  |

### Performance Standard ETRC.6.2 Apply De-Soldering 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 ETRC.6.2.1 Explain desoldering principles. |  |
| CTE ETRC.6.2.2 Describe various types of desoldering equipment and how it is used. |  |
| CTE ETRC.6.2.3 Demonstrate the use of braid-wick and pump solder removers. |  |

## Standard ETRC.7.0: Troubleshooting and Maintenance Techniques

### Performance Standard ETRC.7.1 Apply Troubleshooting 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 ETRC.7.1.1 Explain troubleshooting techniques. |  |
| CTE ETRC.7.1.2 Create and utilize a non-routine task form (job hazard analysis). |  |
| CTE ETRC.7.1.3 Utilize all safety procedures necessary while troubleshooting (lock-out tag-out, etc.). |  |
| CTE ETRC.7.1.4 Select and utilize appropriate tools for electronics troubleshooting. |  |
| CTE ETRC.7.1.5 Research various sources of repair/maintenance/ troubleshooting documentation (print media, electronic media, tech support, local expert, and manufacturer). |  |
| CTE ETRC.7.1.6 Interpret electronic schematic diagrams.  |  |
| CTE ETRC.7.1.7 Measure electrical characteristics of voltage, current, and resistance in basic electronic circuits using multi-meters, oscilloscopes, logic probes, etc. |  |

### Performance Standard ETRC.7.2 Demonstrate Repair Documentation 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 ETRC.7.2.1 Explain the difference between maintenance and repair. |  |
| CTE ETRC.7.2.2 Identify the common causes of system and equipment failures. |  |
| CTE ETRC.7.2.3 Use electrostatic discharge (ESD) control devices and techniques when handling ESD-sensitive equipment and components. |  |
| CTE ETRC.7.2.4 Isolate common faults in wiring and equipment. |  |
| CTE ETRC.7.2.5 Identify common preventive maintenance measures (lubrication, housekeeping, alignment, and filters). |  |
| CTE ETRC.7.2.6 Explain the purposes and requirements for proper recordkeeping. |  |
| CTE ETRC.7.2.7 Interpret preventative maintenance and inspection schedules. |  |

# 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

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1. [Idaho T&I Electronics Technology Program Standards](https://cte.idaho.gov/wp-content/uploads/2017/08/Electronics-Technology_Standards.pdf) [↑](#footnote-ref-1)