ENVIRONMENTAL ENGINEERING STANDARDS

This document was prepared by:

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NEVADA STATE BOARD OF EDUCATION
NEVADA STATE BOARD FOR CAREER AND TECHNICAL EDUCATION

NEVADA DEPARTMENT OF EDUCATION

VISION

All Nevadans ready for success in the 21st century

MISSION

To improve student achievement and educator effectiveness by ensuring opportunities, facilitating learning, and promoting excellence

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ACKNOWLEDGEMENTS

The development of Nevada career and technical standards and assessments is a collaborative effort sponsored by the Office of Career Readiness, Adult Learning & Education Options at the Department of Education and the Career and Technical Education Consortium of States. The Department of Education relies on teachers and industry representatives who have the technical expertise and teaching experience to develop standards and performance indicators that truly measure student skill attainment. Most important, however, is recognition of the time, expertise and great diligence provided by the writing team members in developing the career and technical standards for Environmental Engineering.

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BUSINESS AND INDUSTRY VALIDATION

All CTE standards developed through the Nevada Department of Education are validated by business and industry through one or more of the following processes: (1) the standards are developed by a team consisting of business and industry representatives; or (2) a separate review panel was coordinated with industry experts to ensure the standards include the proper content; or (3) the adoption of nationally-recognized standards endorsed by business and industry.

The Environmental Engineering standards were validated through a complete review by an industry panel.

PROJECT COORDINATOR

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INTRODUCTION

The standards in this document are designed to clearly state what the student should know and be able to do upon completion of an advanced high school Environmental Engineering program. These standards are designed for a three-credit course sequence that prepares the student for a technical assessment directly aligned to the standards.

These exit-level standards are designed for the student to complete all standards through their completion of a program of study. These standards are intended to guide curriculum objectives for a program of study.

The standards are organized as follows:

Content Standards are general statements that identify major areas of knowledge, understanding, and the skills students are expected to learn in key subject and career areas by the end of the program.

Performance Standards follow each content standard. Performance standards identify the more specific components of each content standard and define the expected abilities of students within each content standard.

Performance Indicators are very specific criteria statements for determining whether a student meets the performance standard. Performance indicators may also be used as learning outcomes, which teachers can identify as they plan their program learning objectives.

The crosswalk and alignment section of the document shows where the performance indicators support the Nevada Academic Content Standards in Science (based on the Next Generation Science Standards) and the English Language Arts and Mathematics (based on the Common Core State Standards). Where correlation with an academic content standard exists, students in the Environmental Engineering program perform learning activities that support, either directly or indirectly, achievement of the academic content standards that are listed.

All students are encouraged to participate in the career and technical student organization (CTSO) that relates to their program area. CTSOs are co-curricular national associations that directly enforce learning in the CTE classroom through curriculum resources, competitive events, and leadership development. CTSOs provide students the ability to apply academic and technical knowledge, develop communication and teamwork skills, and cultivate leadership skills to ensure college and career readiness.

The Employability Skills for Career Readiness identify the “soft skills” needed to be successful in all careers, and must be taught as an integrated component of all CTE course sequences. These standards are available in a separate document.

The **Standards Reference Code** is only used to identify or align performance indicators listed in the standards to daily lesson plans, curriculum documents, or national standards.

Program Name	Standards Reference Code
Environmental Engineering	ENENG

Example: ENENG.2.3.4

Standards	Content Standard	Performance Standard	Performance Indicator
Environmental Engineering	2	3	4

CONTENT STANDARD 1.0 : IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES

PERFORMANCE STANDARD 1.1 : DEMONSTRATE GENERAL LAB SAFETY RULES AND PROCEDURES

1.1.1	Describe general shop safety rules and procedures
1.1.2	Demonstrate knowledge of OSHA and its role in workplace safety
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)
1.1.4	Utilize safe procedures for handling of tools and equipment
1.1.5	Operate lab equipment according to safety guidelines
1.1.6	Identify and use proper lifting procedures and proper use of support equipment
1.1.7	Utilize proper ventilation procedures for working within the lab/shop area
1.1.8	Identify marked safety areas
1.1.9	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
1.1.10	Identify the location and use of eye wash stations
1.1.11	Identify the location of the posted evacuation routes
1.1.12	Identify and wear appropriate clothing for lab/shop activities
1.1.13	Secure hair and jewelry for lab/shop activities
1.1.14	Demonstrate knowledge of the safety aspects of low and high voltage circuits
1.1.15	Locate and interpret safety data sheets (e.g., SDS, MSDS)
1.1.16	Prepare time or job cards, reports or records
1.1.17	Perform housekeeping duties
1.1.18	Follow verbal instructions to complete work assignments
1.1.19	Follow written instructions to complete work assignments

PERFORMANCE STANDARD 1.2 : IDENTIFY AND UTILIZE HAND TOOLS

1.2.1	Identify hand tools and their appropriate usage
1.2.2	Identify standard and metric designation
1.2.3	Demonstrate the proper techniques when using hand tools
1.2.4	Demonstrate safe handling and use of appropriate tools
1.2.5	Demonstrate proper cleaning, storage, and maintenance of tools

PERFORMANCE STANDARD 1.3 : IDENTIFY AND UTILIZE POWER TOOLS AND EQUIPMENT

1.3.1	Identify power tools and their appropriate usage
1.3.2	Identify equipment and their appropriate usage
1.3.3	Demonstrate the proper techniques when using power tools and equipment
1.3.4	Demonstrate safe handling and use of appropriate power tools and equipment
1.3.5	Demonstrate proper cleaning, storage, and maintenance of power tools and equipment

CONTENT STANDARD 2.0 : ASSESS THE IMPACT OF ENGINEERING ON SOCIETY	
PERFORMANCE STANDARD 2.1 : DESCRIBE HISTORY OF ENGINEERING	
2.1.1	Define engineering
2.1.2	Identify engineering achievements throughout history
2.1.3	Research how historical period and regional style have influenced engineering design
2.1.4	Investigate the evolution of a product
PERFORMANCE STANDARD 2.2 : INVESTIGATE RELATED CAREERS IN ENGINEERING	
2.2.1	Investigate engineering careers, training, and associated opportunities
2.2.2	Describe the difference between engineering disciplines and job functions
2.2.3	Explore career opportunities and list the educational requirements for a given engineering field
2.2.4	Describe the importance of engineering teams
PERFORMANCE STANDARD 2.3 : ANALYZE ETHICS IN ENGINEERING	
2.3.1	Analyze current professional engineering codes of ethics
2.3.2	Analyze ethical engineering issues
2.3.3	Analyze and explain ethical and technical issues contributing to an engineering disaster
2.3.4	Describe how ethics influences the engineering process

CONTENT STANDARD 3.0 : ANALYZE THE ENGINEERING DESIGN PROCESS	
PERFORMANCE STANDARD 3.1 : INTERPRET THE ENGINEERING DESIGN PROCESS	
3.1.1	Identify the design process
3.1.2	Identify the activities that occur during each phase of the design process
3.1.3	Apply the steps of the design process to solve a variety of design problems
3.1.4	Describe how social, environmental, and financial constraints influence the design process
3.1.5	Diagram the lifecycle of a product

CONTENT STANDARD 4.0 : CONSTRUCT ENGINEERING DOCUMENTATION	
PERFORMANCE STANDARD 4.1 : DEMONSTRATE FREEHAND TECHNICAL SKETCHING TECHNIQUES	
4.1.1	Develop design ideas using freehand sketching
4.1.2	Identify the six primary orthographic views
4.1.3	Create pictorial and multi-view sketches
4.1.4	Create rough, refined, and presentation sketches
4.1.5	Utilize the alphabet of lines (i.e., styles and weights)
4.1.6	Legibly annotate sketches
PERFORMANCE STANDARD 4.2 : DEMONSTRATE MEASURING AND SCALING TECHNIQUES	
4.2.1	Identify industry standard units of measure
4.2.2	Convert between industry standard units of measure
4.2.3	Determine appropriate engineering and metric scales
4.2.4	Measure speed, distance, object size, area, mass, volume, and temperature
4.2.5	Determine and apply the equivalence between fractions and decimals
4.2.6	Demonstrate proper use of precision measuring tools
PERFORMANCE STANDARD 4.3 : UTILIZE ENGINEERING DOCUMENTATION PROCEDURES	
4.3.1	Demonstrate record keeping procedures and communication in engineering
4.3.2	Identify the importance of proprietary documentation in engineering
4.3.3	Research the copyright and patent process
4.3.4	Illustrate project management timelines
PERFORMANCE STANDARD 4.4 : PRODUCE TECHNICAL DRAWINGS	
4.4.1	Interpret basic elements of a technical drawing (i.e., title block information, dimensions, and line types)
4.4.2	Produce drawings from sketches
4.4.3	Identify industry standard symbols
4.4.4	Describe and construct various types of drawings (i.e., part, assembly, pictorial, orthographic, isometric, and schematic)
4.4.5	Construct drawings utilizing metric and customary (i.e., SAE and Imperial) measurement systems
4.4.6	Create schematic diagrams using proper symbols
4.4.7	Arrange dimensions and annotations using appropriate standards (i.e., ANSI and ISO)
4.4.8	Construct bill of materials or schedule
PERFORMANCE STANDARD 4.5 : DEMONSTRATE MODELING TECHNIQUES	
4.5.1	Identify the areas of modeling (i.e., physical, conceptual, and mathematical)
4.5.2	Create a scale model or working prototype
4.5.3	Evaluate a scale model or a working prototype
4.5.4	Identify methods and sources for obtaining materials and supplies

CONTENT STANDARD 5.0 : INVESTIGATE MATERIAL PROPERTIES	
PERFORMANCE STANDARD 5.1 : IDENTIFY MATERIAL PROPERTIES AND SCIENCE	
5.1.1	Identify the major material families used in manufacturing
5.1.2	Differentiate between the various types of material properties and their applications
5.1.3	Discuss the impact of material usage on the environment
5.1.4	Explain how production is affected by the availability, quality, and quantity of resources
5.1.5	Differentiate among raw material standard stock and finished products
PERFORMANCE STANDARD 5.2 : ANALYZE THE STRENGTHS OF MATERIALS	
5.2.1	Describe the various forms of stress (i.e., compression, tension, torque, and shear)
5.2.2	Calculate material properties relating to a stress strain curve
5.2.3	Analyze the principles of statics and dynamics to calculate the strength of various engineering materials used to build a structure
5.2.4	Create free body diagrams of objects, identifying all forces acting on the object
5.2.5	Locate the centroid of geometric shapes using mathematics
5.2.6	Calculate the moment of inertia for a rectangular shape
5.2.7	Differentiate between scalar and vector quantities
5.2.8	Determine magnitude, direction, and sense of a vector
5.2.9	Calculate the X and Y components and determine the resultant vector
5.2.10	Calculate moment forces given a specified axis
5.2.11	Use equations of static equilibrium to calculate unknown forces
5.2.12	Create a written report of material test evaluations

CONTENT STANDARD 6.0 : APPLY FUNDAMENTAL POWER SYSTEMS AND ENERGY PRINCIPLES	
PERFORMANCE STANDARD 6.1 : INVESTIGATE POWER SYSTEMS AND ENERGY FORMS	
6.1.1	Define terms used in power systems (e.g., power, work, horsepower, watts, etc.)
6.1.2	Identify the basic power systems
6.1.3	List the basic elements of power systems
6.1.4	Summarize the advantages and disadvantages of various forms of power
6.1.5	Calculate the efficiency of power systems and conversion devices
6.1.6	Define energy
6.1.7	Define potential energy and kinetic energy
6.1.8	Identify forms of potential energy and kinetic energy
6.1.9	Categorize types of energy into major forms such as, thermal, radiant, nuclear, chemical, electrical, mechanical, and fluid
6.1.10	Identify units used to measure energy
6.1.11	Analyze and apply data and measurements to solve problems and interpret documents
6.1.12	Calculate unit conversions between common energy measurements
6.1.13	Demonstrate an energy conversion device
PERFORMANCE STANDARD 6.2 : IDENTIFY AND UTILIZE BASIC MECHANICAL SYSTEMS	
6.2.1	Distinguish between the six simple machines, their attributes and components
6.2.2	Measure forces and distances related to mechanisms
6.2.3	Determine efficiency in a mechanical system
6.2.4	Calculate mechanical advantage and drive ratios of mechanisms
6.2.5	Calculate work, power, and torque
6.2.6	Design, construct, and test various basic mechanical systems
PERFORMANCE STANDARD 6.3 : IDENTIFY AND UTILIZE ENERGY SOURCES AND APPLICATIONS	
6.3.1	Identify and categorize energy sources as nonrenewable, renewable, or inexhaustible
6.3.2	Define the possible types of power conversion
6.3.3	Measure circuit values using a digital multimeter
6.3.4	Calculate power in a system that converts energy from electrical to mechanical
6.3.5	Determine efficiency of a system that converts an electrical input to a mechanical output
6.3.6	Compute values of current, resistance, and voltage using Ohm's law
6.3.7	Solve series and parallel circuits using basic laws of electricity including Kirchhoff's laws
6.3.8	Test and apply the relationship between voltage, current, and resistance relating to a photovoltaic cell and a hydrogen fuel cell
6.3.9	Experiment with a solar hydrogen system to produce mechanical power
6.3.10	Design, construct, and test recyclable insulation materials
6.3.11	Test and apply the relationship between R-values and recyclable insulation
6.3.12	Complete calculations for conduction, R-values, and radiation

PERFORMANCE STANDARD 6.4 : IDENTIFY AND UTILIZE MACHINE CONTROL SYSTEMS	
6.4.1	Create detailed operational flowcharts
6.4.2	Create system control programs (i.e., sequential, logic)
6.4.3	Select appropriate input and output devices based on system specifications and constraints
6.4.4	Differentiate between the characteristics of digital and analog devices
6.4.5	Compare and contrast open and closed loop systems
6.4.6	Design and create a control system based on specifications and constraints
PERFORMANCE STANDARD 6.5 : IDENTIFY AND UTILIZE BASIC FLUID SYSTEMS	
6.5.1	Define fluid systems (e.g., hydraulic, pneumatic, vacuum, etc.)
6.5.2	Identify and define the components of fluid systems
6.5.3	Compare and contrast hydraulic and pneumatic systems
6.5.4	Identify the advantages and disadvantages of using fluid power systems
6.5.5	Explain the difference between gauge pressure and absolute pressure
6.5.6	Discuss the safety concerns of working with liquids and gases under pressure
6.5.7	Calculate mechanical advantage using Pascal's law
6.5.8	Calculate values in a pneumatic system using the ideal gas laws
6.5.9	Design, construct, and test various fluid systems
PERFORMANCE STANDARD 6.6 : IDENTIFY THERMODYNAMICS	
6.6.1	Define thermodynamic terminology
6.6.2	Distinguish thermodynamic concepts (i.e., conduction, convection, and radiation)
6.6.3	Identify the common units of measurement
6.6.4	Explain the laws of thermodynamics
6.6.5	Calculate the thermal efficiency of various materials

CONTENT STANDARD 7.0 : APPLY STATISTICS AND KINEMATIC PRINCIPLES	
PERFORMANCE STANDARD 7.1 : UTILIZE STATISTICS	
7.1.1	Define statistical terminology
7.1.2	Calculate theoretical probability
7.1.3	Calculate experimental frequency distribution
7.1.4	Apply the Bernoulli process to events that only have two distinct possible outcomes
7.1.5	Apply AND, OR, and NOT logic to probability
7.1.6	Apply Bayes' theorem to calculate the probability of multiple events occurring
7.1.7	Create a histogram to illustrate frequency distribution
7.1.8	Calculate the central tendency of a data array to include mean, median, and mode
7.1.9	Calculate data variation to include range, standard deviation, and variance
PERFORMANCE STANDARD 7.2 : UTILIZE KINEMATIC PRINCIPLES	
7.2.1	Define kinematic terminology
7.2.2	Calculate distance, displacement, speed, velocity, and acceleration based on specific data
7.2.3	Calculate acceleration due to gravity based on data from a free-fall device
7.2.4	Calculate the X and Y components of a projectile motion
7.2.5	Determine the needed launch angle of a projectile for a specific range and initial velocity
7.2.6	Design a device that stores and releases potential energy for propulsion

CONTENT STANDARD 8.0 : INVESTIGATE ENVIRONMENTAL SUSTAINABILITY

PERFORMANCE STANDARD 8.1 : ANALYZE WATER MANAGEMENT CONCEPTS

8.1.1	Recognize that hundreds of millions of people suffer from a lack of access to clean, safe water
8.1.2	Discuss the characteristics of clean water and why it is necessary for survival
8.1.3	Investigate the most common sources of drinking water
8.1.4	Research common sources of drinking water contamination
8.1.5	Describe how human health is affected by the quality of drinking water sources
8.1.6	Analyze the environmental and physical factors that affect local to regional accessibility to clean, safe drinking water
8.1.7	Analyze the relationship between population growth and water resources
8.1.8	Explain how water quality is quantitatively measured using chemical and biologically based testing processes
8.1.9	Select and properly use the appropriate tool for accurately measuring specific volumes
8.1.10	Perform and analyze water samples to detect contaminants
8.1.11	Model a water purification process that includes filtration and treatment
8.1.12	Describe the interacting roles of microorganisms in a wastewater treatment ecosystem
8.1.13	Utilize the engineering design process to design, build, and test a water treatment system

PERFORMANCE STANDARD 8.2 : INVESTIGATE BIOFUEL ENERGY SOURCES

8.2.1	Describe the differences between renewable and non-renewable sources of energy
8.2.2	Explain the similarities and the differences between biofuels and fossil fuels
8.2.3	Describe the past, present, and future of biofuels and fossil fuels
8.2.4	Compare and contrast environmental effects from burning of fossil fuels verses biofuels
8.2.5	Discuss biofuel energy production
8.2.6	Illustrate the process of photosynthesis and how energy is stored in algae and plants
8.2.7	Describe the two main phases of the bio-manufacturing process
8.2.8	Describe how complex lipids can produce biodiesel
8.2.9	Summarize the bio-manufacturing processes for producing cellulosic ethanol
8.2.10	Utilize the engineering design process to solve an open-ended design problem
8.2.11	Analyze the performance and design requirements of a solution to determine its effectiveness

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CROSSWALKS AND ALIGNMENTS OF ENVIRONMENTAL ENGINEERING STANDARDS AND THE NEVADA ACADEMIC CONTENT STANDARDS AND THE COMMON CAREER TECHNICAL CORE STANDARDS

CROSSWALKS (ACADEMIC STANDARDS)

The crosswalk of the Environmental Engineering Standards shows links to the Nevada Academic Content Standards in Science (based on the Next Generation Science Standards – Disciplinary Core Ideas Arrangement) and the English Language Arts and Mathematics (based on the Common Core State Standards). The crosswalk identifies the performance indicators in which the learning objectives in the Environmental Engineering program support academic learning. The performance indicators are grouped according to their content standard and are crosswalked to the Nevada Academic Content Standards in Science, English Language Arts, and Mathematics.

ALIGNMENTS (MATHEMATICAL PRACTICES)

In addition to correlation with the Nevada Academic Content Standards for Mathematics, many performance indicators support the Mathematical Practices. The following table illustrates the alignment of the Environmental Engineering Standards Performance Indicators and the Mathematical Practices. This alignment identifies the performance indicators in which the learning objectives in the Environmental Engineering program support academic learning.

CROSSWALKS (COMMON CAREER TECHNICAL CORE)

The crosswalk of the Environmental Engineering Standards shows links to the Common Career Technical Core. The crosswalk identifies the performance indicators in which the learning objectives in the Environmental Engineering program support the Common Career Technical Core. The Common Career Technical Core defines what students should know and be able to do after completing instruction in a program of study. The Environmental Engineering Standards are crosswalked to the Science, Technology, Engineering & Mathematics Career Cluster™ and the Engineering & Technology Career Pathway.

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CROSSWALK OF ENVIRONMENTAL ENGINEERING STANDARDS AND THE NEVADA ACADEMIC CONTENT STANDARDS

CONTENT STANDARD 1.0: IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES

Performance Indicators	Common Core State Standards and Nevada Science Standards
1.1.1	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
1.1.2	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. **English Language Arts: Speaking and Listening Standards** SL.11-12.1a Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
1.1.9	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
1.1.15	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
1.1.16	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

1.1.18	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **English Language Arts: Speaking and Listening Standards** SL.11-12.1d Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.
1.1.19	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

CONTENT STANDARD 2.0: ASSESS THE IMPACT OF ENGINEERING ON SOCIETY

Performance Indicators	Nevada Academic Content Standards
2.1.3	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
2.1.4	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
2.2.2	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
2.2.4	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
2.3.1	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
2.3.2	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
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CONTENT STANDARD 3.0: ANALYZE THE ENGINEERING DESIGN PROCESS

Performance Indicators	Nevada Academic Content Standards
3.1.3	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
3.1.4	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Speaking and Listening Standards** SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

CONTENT STANDARD 4.0: CONSTRUCT ENGINEERING DOCUMENTATION

Performance Indicators	Nevada Academic Content Standards
4.3.1	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
4.3.3	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
4.5.3	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CONTENT STANDARD 5.0: INVESTIGATE MATERIAL PROPERTIES

Performance Indicators	Nevada Academic Content Standards
5.1.2	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
5.1.3	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Speaking and Listening Standards** SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
5.1.4	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
5.2.1	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
5.2.2	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
5.2.3	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
5.2.6	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
5.2.7	**Math: Number & Quantity – Vector and Matrix Quantities** NVM.A.1 (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $\mathbf{v}$, $\lvert\mathbf{v}\rvert$, $\lVert\mathbf{v}\rVert$, v).
5.2.8	**Math: Number & Quantity – Vector and Matrix Quantities** NVM.A.1 (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $\mathbf{v}$, $\lvert\mathbf{v}\rvert$, $\lVert\mathbf{v}\rVert$, v).
5.2.9	**Math: Number & Quantity – Vector and Matrix Quantities** NVM.A.2 (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

5.2.10	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
5.2.11	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
5.2.12	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CONTENT STANDARD 6.0: APPLY FUNDAMENTAL POWER SYSTEMS AND ENERGY PRINCIPLES

Performance Indicators	Nevada Academic Content Standards
6.1.4	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
6.1.5	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
6.1.11	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
6.1.13	**English Language Arts: Speaking and Listening Standards** SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
6.2.3	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
6.2.4	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
6.2.5	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
6.4.4	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
6.4.5	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
6.5.3	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
6.5.5	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

6.5.6	**English Language Arts: Speaking and Listening Standards** SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
6.5.7	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **Math: Algebra – Arithmetic with Polynomials and Rational Expressions** AAPR.C.5 (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.
6.5.8	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
6.6.2	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
6.6.4	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

CONTENT STANDARD 7.0: APPLY STATISTICS AND KINEMATIC PRINCIPLES

Performance Indicators	Nevada Academic Content Standards
7.1.2	**Math: Statistics and Probability – Conditional Probability and the Rules of Probability** SCP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
7.1.3	**Math: Statistics and Probability – Conditional Probability and the Rules of Probability** SCP.A.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.
7.1.4	**Math: Statistics and Probability – Conditional Probability and the Rules of Probability** SCP.A.2 Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
7.1.5	**Math: Statistics and Probability – Conditional Probability and the Rules of Probability** SCP.A.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
7.1.6	**Math: Statistics and Probability – Conditional Probability and the Rules of Probability** SCP.A.3 Understand the conditional probability of *A* given *B* as *P(A* and *B)/P(B)*, and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.
7.1.8	**Math: Statistics and Probability – Interpreting Categorical and Quantitative Data** SID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
7.1.9	**Math: Statistics and Probability – Interpreting Categorical and Quantitative Data** SID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
7.2.2	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
7.2.3	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
7.2.4	**Math: Number & Quantity – Vector and Matrix Quantities** NVM.A.2 (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
7.2.5	**Math: Algebra – Reasoning with Equations and Inequalities** AREI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

CONTENT STANDARD 8.0: INVESTIGATE ENVIRONMENTAL SUSTAINABILITY CONCEPTS

Performance Indicators	Nevada Academic Content Standards
8.1.2	**English Language Arts: Speaking and Listening Standards** SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
8.1.3	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
8.1.4	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
8.1.5	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
8.1.6	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
8.1.7	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
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8.1.11	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

8.1.12	**English Language Arts: Reading Standards for Literacy in Science and Technical Subjects** RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
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8.2.11	**English Language Arts: Writing Standards for Literacy in Science and Technical Subjects** WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

ALIGNMENT OF ENVIRONMENTAL ENGINEERING STANDARDS AND THE MATHEMATICAL PRACTICES

Mathematical Practices	Environmental Engineering Performance Indicators
1. Make sense of problems and persevere in solving them.	5.2.2, 5.2.3, 5.2.5
2. Reason abstractly and quantitatively.	4.2.4, 4.2.5; 4.5.1 5.2.2, 5.2.6, 5.2.8, 5.2.9, 5.2.10, 5.2.11 6.1.5, 6.1.12; 6.2.4; 6.2.5; 6.3.12; 6.5.7, 6.5.8; 6.6.4 7.1.5, 7.1.6; 7.2.2, 7.2.3, 7.2.4, 7.2.5
3. Construct viable arguments and critique the reasoning of others.	6.1.11; 6.3.5 8.1.8
4. Model with mathematics.	4.5.1, 4.5.2, 4.5.3 7.1.4
5. Use appropriate tools strategically.	4.2.2, 4.2.3, 4.2.4, 4.2.6 5.2.3, 5.2.8 6.2.2; 6.3.3, 6.3.4 8.1.9
6. Attend to precision.	4.2.2, 4.2.4, 4.2.5, 4.2.6; 4.5.2 5.2.2, 5.2.3, 5.2.6, 5.2.8, 5.2.9, 5.2.10, 5.2.11 6.1.5, 6.1.12; 6.2.2, 6.2.4, 6.2.5; 6.3.3, 6.3.6, 6.3.7, 6.3.11, 6.3.12 6.5.7, 6.5.8; 6.6.5 7.1.2, 7.1.3, 7.1.8, 7.1.9; 7.2.2, 7.2.3, 7.2.4, 7.2.5 8.1.9
7. Look for and make use of structure.	5.2.7, 5.2.8 6.2.3; 6.3.5
8. Look for and express regularity in repeated reasoning.	

CROSSWALKS OF ENVIRONMENTAL ENGINEERING STANDARDS AND THE COMMON CAREER TECHNICAL CORE

Science, Technology, Engineering & Mathematics Career Cluster™ (ST)	Performance Indicators
1. Apply engineering skills in a project that requires project management, process control and quality assurance.	4.3.1 – 4.3.4 6.1.13; 6.2.6; 6.3.10 6.4.6; 6.5.9; 6.6.5 7.2.6; 8.1.10, 8.1.13 8.2.10, 8.2.11
2. Use technology to acquire, manipulate, analyze and report data.	4.4.4; 5.2.12; 6.1.11 8.1.10
3. Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.	1.1.1 – 1.1.19; 1.2.4; 1.3.4
4. Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster™ and the role of STEM in society and the economy.	2.1.1 – 2.1.3
5. Demonstrate an understanding of the breadth of career opportunities and means to those opportunities in each of the Science, Technology, Engineering & Mathematics Career Pathways.	2.2.1 – 2.2.3
6. Demonstrate technical skills needed in a chosen STEM field.	6.1.13; 6.2.6; 6.3.10; 6.4.6 6.5.9; 7.1.6; 8.1.10, 8.1.13 8.2.10, 8.2.11

Engineering & Technology Career Pathway (ST-ET)	Performance Indicators
1. Use STEM concepts and processes to solve problems involving design and/or production.	3.1.3; 4.5.1 – 4.5.3 8.1.10, 8.1.13 8.2.10, 8.2.11
2. Display and communicate STEM information.	4.3.1, 4.3.4
3. Apply processes and concepts for the use of technological tools in STEM.	3.1.2; 4.5.1; 8.1.9
4. Apply the elements of the design process.	3.1.1 – 3.1.5 8.1.13; 8.2.10
5. Apply the knowledge learned in STEM to solve problems.	3.1.3; 6.1.11 8.2.10, 8.2.11
6. Apply the knowledge learned in the study of STEM to provide solutions to human and societal problems in an ethical and legal manner.	2.3.1 – 2.3.4 8.1.13; 8.2.10