



# Spokane Public Schools Pre-engineering

<b>Course: Pre-Engineering</b>	<b>Total Framework Hours: 315 Hours</b>
<b>CIP Code: 149995</b> <input checked="" type="checkbox"/> <b>Exploratory</b> <input type="checkbox"/> <b>Preparatory</b>	<b>Date Last Modified: 1/5/2015</b>
<b>Career Cluster: Science, Technology, Engineering and Mathematics</b>	<b>Cluster Pathway: STEM</b>

## UNIT/AREA OF EMPHASIS: Safety

### COMPONENTS AND ASSESSMENTS

**Performance Assessments:**

- Pass written safety exam(s) with 100% accuracy.
- Pass safety demonstration(s) using specific tools and equipment with 100% accuracy.
- Demonstrate safety steps and techniques consistently.

**Leadership Alignment: 21<sup>st</sup> Century Skills**

**Organization**

**Use Systems Thinking**

- Students will show organizational skills when they analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

### *Standards and Competencies*

**Standard/Unit:  
Safety**

**Core Competencies**

**Total Learning Hours for Unit: 10 Hours**

- Explain the role and importance of safety in related fields
- Learn and use safety rules and practices
- Demonstrate proper techniques for use in operation of basic equipment
- Recognize and inform instructor of unsafe working conditions
- Explain the concept of First Aid and its particular importance to workers
- List tools hazards that are associated with pertinent class activities
- Demonstrate correct use/operation of tools and machinery
- Explain eye and ear protection
- Demonstrate the use and care of appropriate personal protective equipment (PPE)
- Follow the safety procedures required for lifting heavy objects
- Describe safe behavior on and around ladders and scaffolds
- Describe information found on a Material Safety Data Sheet (MSDS) and proper disposal of hazardous materials

<b>Aligned Washington State Standards</b>	
<b>Arts</b>	<b>N/A</b>
<b>Educational Technology</b>	2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.2.1 Develop skills to use technology effectively.
<b>Health &amp; Fitness</b>	2.4.2 Applies first-aid skills, ways to prevent injuries, and skills to respond appropriately and safely. 3.1.2 Analyzes how environmental factors impact health.
<b>Language (AS)</b>	AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
<b>Math</b>	<b>N/A</b>
<b>Reading (AS)</b>	AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. AS.R.7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
<b>Science: NGSS</b>	<b>N/A</b>
<b>Social Studies</b>	<b>N/A</b>
<b>Speaking &amp; Listening</b>	AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
<b>Writing (AS)</b>	AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**UNIT/AREA OF EMPHASIS: Pre-engineering (Design & Modeling) – Intro to Engineering**

**COMPONENTS AND ASSESSMENTS**

**Performance Assessments:**

- Engineering Notebook
- Portfolio
- Competency Demonstration

**Leadership Alignment:** 21<sup>st</sup> Century Skills

**Learning & Innovation - Creativity and Innovation:**

**Think Creatively**

- Students will show creativity and innovation when they use a wide range of idea creation techniques (such as brainstorming)
- Students will show creativity and innovation by creating new and worthwhile ideas (both incremental and radical concepts)
- Students will show creativity and innovation when they elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts.

**Work Creatively with Others**

- Students will show creativity and collaboration when they view failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

**Implement Innovations**

- Students will show creativity and collaboration act on creative ideas to make tangible and useful contribution to the field in which the innovation will occur

**Information, Media & Technology – Information Literacy****Access and Evaluate Information**

4.A.2 Students will show information when they evaluate information critically and completely.

**Standards and Competencies****Standard/Unit 2:  
What is Engineering****Core Competencies****Total Learning Hours for Unit: 12 Hours**

- Utilize standard procedures to use and maintain an engineering notebook.
- Use guidelines for developing and maintaining an engineering notebook to evaluate and select pieces of one's own work for inclusion in a portfolio
- Describe the relationship between science, technology, engineering, and math
- Identify the differences between invention and innovation
- Operate as an effective member of a team to complete an investigation
- Describe engineering and explain how engineers participate in or contribute to the invention and innovation of products
- Describe impacts that technology has had on society

**Aligned Washington State Standards**

<b>Arts</b>	N/A
<b>Educational Technology</b>	1.2.1 Communicate and collaborate to learn with others. 1.3.2 Locate and organize information from a variety of sources and media.
<b>Health &amp; Fitness</b>	N/A
<b>Language (AS)</b>	<b>AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression</b>
<b>Math</b>	N/A
<b>Reading (AS)</b>	AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. AS.R.7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
<b>Science: NGSS</b>	<b>N/A</b>
<b>Social Studies</b>	4.2.3 Understand and analyze how technology and ideas have impacted Washington State or world history. 5.2.2 Evaluates the breadth of primary and secondary sources and analyzes notes to determine the need for additional information while researching an issue or event.
<b>Speaking &amp; Listening (AS)</b>	AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. AS.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

	AS.SL.5 Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
Writing (AS)	<p>AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>AS.W.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.</p> <p>AS.W.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.</p> <p>AS.W.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 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.</p> <p>AS.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.</p>
<b>UNIT/AREA OF EMPHASIS: Pre-engineering (Design &amp; Modeling) – The Design Process</b>	
<b>COMPONENTS AND ASSESSMENTS</b>	
<p><b>Performance Assessments:</b></p> <ul style="list-style-type: none"> <li>Students will be able use the Design Process and show an application.</li> <li>Students will show their understanding of the design process by showing their understanding of the solving problems using the decision matrix.</li> </ul>	
<p><b>Leadership Alignment:</b> 21<sup>st</sup> Century Skills</p> <p style="text-align: center;"><b>Learning &amp; Innovation – Communication and Collaboration:</b></p> <ul style="list-style-type: none"> <li>Student will describe the elements of design, the purpose of working in a team and be able to use the design process to solve a problem within engineering.</li> </ul>	
<b>Standards and Competencies</b>	
<b>Standard/Unit:</b>	
Design Process	
<b>Core Competencies</b>	<b>Total Learning Hours for Unit: 15 Hours</b>
<ul style="list-style-type: none"> <li>Describe the design process and how it is used to aid in problem solving</li> <li>Describe the elements of design</li> <li>Recognize design criteria and constraints</li> <li>Describe the purpose and importance of working in a team</li> <li>Use the design process to solve a technical problem</li> <li>Apply the elements of design to the design process</li> <li>Explain a design brief and apply the concept when using the design process</li> <li>Operate effectively as a member of a team to complete a design project</li> <li>Use a decision matrix to select the best solution to a design</li> </ul>	
<b>Aligned Washington State Standards</b>	
<b>Arts</b>	<p>1.1: Understand and apply arts concepts and vocabulary.</p> <p>4.2: Demonstrate and analyze the connections among the arts and between the arts and other content areas.</p>
<b>Educational Technology</b>	<p>1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.</p> <p>1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.</p>

	<p>1.2.1 Communicate and collaborate to learn with others.</p> <p>1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.</p> <p>1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.</p> <p>1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.</p> <p>2.4.1 Formulate and synthesize new knowledge.</p>
<b>Health and Fitness</b>	N/A
<b>Language (AS)</b>	<p>AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.</p> <p>AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.</p> <p>AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.</p>
<b>Math</b>	N/A
<b>Reading (AS)</b>	<p>AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.</p> <p>AS.R.7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.</p>
<b>Science: NGSS</b>	<p><b>MS-ETS1-1 Engineering Design</b></p> <p>MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p> <p>MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p>
<b>Social Studies</b>	<p>5.2.1 Create and Use research questions to guide inquiry on an issue or event.</p> <p>5.2.2 Evaluates the breadth of primary and secondary sources and analyzes notes to determine the need for additional information while researching an issue or event.</p>
<b>Speaking &amp; Listening (AS)</b>	<p>AS.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p>
<b>Writing (AS)</b>	<p>AS.W.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.</p> <p>AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>
<b>UNIT/AREA OF EMPHASIS: Pre-engineering (Design &amp; Modeling) – Measurement</b>	
<b>COMPONENTS AND ASSESSMENTS</b>	
<p><b>Performance Assessments:</b></p> <ul style="list-style-type: none"> <li>Students will be able to demonstrate conversion accuracy in context</li> </ul>	
<p><b>Leadership Alignment:</b></p> <ul style="list-style-type: none"> <li>Students will use problem solving to design a TSA Dragster or Flight event components and activities integration and or TSA Leadership lesson.</li> </ul>	

**Standards and Competencies**

**Standard/Unit:**

Students will be able show their understanding of measurement within a building project.

**Competencies**

**Total Learning Hours for Unit: 10 Hours**

- Select the appropriate value from a conversion chart to convert between standard and metric unit
- Convert between standard and metric measurements including inches, feet, yards, millimeters, centimeters, and meters
- Demonstrate the ability to measure accurately with different devices and scales using both the standard and metric systems
- Explain how to measure in different contexts

**Aligned Washington State Standards**

<b>Arts</b>	<b>N/A</b>
<b>Educational Technology</b>	1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.3.2 Locate and organize information from a variety of sources and media. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.
<b>Health &amp; Fitness</b>	<b>N/A</b>
<b>Language (AS)</b>	AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
<b>Math</b>	<b>N/A</b>
<b>Reading (AS)</b>	AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
<b>Science: NGSS</b>	<b>N/A</b>
<b>Social Studies</b>	<b>N/A</b>
<b>Speaking &amp; Listening (AS)</b>	<b>N/A</b>
<b>Writing (AS)</b>	AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**UNIT/AREA OF EMPHASIS: Design & Modeling – Sketching & Dimensioning**

**COMPONENTS AND ASSESSMENTS**

**Performance Assessments:**

Rubric/check sheet for demonstration of identified criterion associated with:

- Two-dimension Sketches
  - Three-dimension Sketches
  - Thumbnail Sketches
  - Perspective Sketches
  - Isometric Sketches
  - Orthographic Sketches
- One and Two Point Perspective Interpretations  
Peer and self-assessment
- Demonstrate application of identified sketches

**Leadership Alignment:**

- Students will be able to use problem solving to participate in collaboration as they complete a TSA Construction Challenge event components and activities integration.

**Standards and Competencies**

**Standard/Unit:**  
**Students will be able to show sketching and dimensioning techniques in a variety of different sketches.**

**Core Competencies** **Total Learning Hours for Unit: 13 Hours**

- Summarize the reasoning for using sketching as a communication tool
- Use visualization, spatial reasoning, and geometric shapes to sketch two and three dimensional shapes
- Recognize thumbnail, perspective, isometric, and orthographic sketches
- Recognize one and two point perspective drawings
- Create thumbnail, perspective, isometric, and orthographic sketches
- Accurately interpret one and two point perspective drawings
- Communicate ideas for a design using various sketching methods, notes, and drafting views
- Dimension an orthographic sketch following the guidelines of dimensioning

**Aligned Washington State Standards**

<b>Arts</b>	1.1: Understand and apply arts concepts and vocabulary. 1.2: Develop arts skills and techniques. 2.2: Apply a performance and/or presentation process to the arts 3.2: Use the arts to communicate for a specific purpose. 4.2: Demonstrate and analyze the connections among the arts and between the arts and other content areas. 4.5: Understand how arts knowledge and skills are used in the world of work, including careers in the arts.
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<b>Educational Technology</b>	1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions. 2.2.1 Develop skills to use technology effectively. 2.4.1 Formulate and synthesize new knowledge.
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<b>Language (AS)</b>	AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
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<b>Math</b>	<p><b>Ratios and Proportional Relationships</b></p> 7.r.P.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour. <p><b>The Number System</b></p> 7.n.S.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. 7.n.S.3 Solve real-world and mathematical problems involving the four operations with rational numbers.1 <p><b>Geometry</b></p> 7.G.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. 7.G.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing
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	triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. 8.G.1 Verify experimentally the properties of rotations, reflections, and translations: 8.G.1.a Lines are taken to lines, and line segments to line segments of the same length 8.G.1.c Parallel lines are taken to parallel lines
<b>Reading (AS)</b>	AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
<b>Science: NGSS</b>	N/A
<b>Social Studies</b>	N/A
<b>Speaking &amp; Listening (AS)</b>	N/A
<b>Writing (AS)</b>	AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
<b>UNIT/AREA OF EMPHASIS: Pre-engineering (Design &amp; Modeling) – Designing for Production</b>	
<b>COMPONENTS AND ASSESSMENTS</b>	
<b>Performance Assessments:</b> <ul style="list-style-type: none"> <li>• Students will be able to apply the design process to CAD-modeled parts.</li> <li>• Students will be able to use a three-dimensional (3D) model of an object meeting identified criterion.</li> <li>• Students will be able to use the decision making matrix (meeting design brief constraints).</li> <li>• Students will be able to show effective use of equipment to create final product.</li> </ul>	
<b>Leadership Alignment:</b> Students will show collaboration and systems thinking by participating in a TSA Construction Challenge event components and activities integration.	
<b><i>Standards and Competencies</i></b>	
<b>Standard/Unit:</b> <b>Designing for Production</b>	
<b>Core Competencies</b>	<b>Total Learning Hours for Unit: 30 Hours</b>
<ul style="list-style-type: none"> <li>• Apply geometric and dimension constraints</li> <li>• Assemble the product using the CAD modeling program</li> <li>• Demonstrate the ability to produce various annotated working drawings of a 3D model</li> <li>• Identify the difference between a prototype, a model and a mock-up</li> <li>• Analyze what circumstances call for the use of a prototype, a model, and a mock-up</li> <li>• Describe why teams of people are used to solve problems</li> <li>• Brainstorm and sketch possible solutions to an existing design problem</li> <li>• Create a decision-making matrix</li> <li>• Use a decision making matrix to select an approach that meets or satisfies the constraints given in a design brief</li> <li>• Use appropriate tools, equipment and/or machinery to produce a prototype</li> </ul>	
<b><i>Aligned Washington State Standards</i></b>	
<b>Arts</b>	1.1: Understand and apply arts concepts and vocabulary.



	<p>1.2: Develop arts skills and techniques.</p> <p>2.2: Apply a performance and/or presentation process to the arts</p> <p>3.2: Use the arts to communicate for a specific purpose.</p> <p>4.2: Demonstrate and analyze the connections among the arts and between the arts and other content areas.</p>
<b>Educational Technology</b>	<p>1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.</p> <p>1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.</p> <p>1.2.1 Communicate and collaborate to learn with others.</p> <p>1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.</p> <p>1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.</p> <p>1.3.2 Locate and organize information from a variety of sources and media.</p> <p>1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.</p> <p>1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.</p> <p>2.1.1 Practice personal safety.</p> <p>2.2.1 Develop skills to use technology effectively.</p> <p>2.2.2 Use a variety of hardware to support learning.</p> <p>2.4.1 Formulate and synthesize new knowledge.</p>
<b>Language (AS)</b>	<p><b>AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.</b></p> <p><b>AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.</b></p> <p><b>AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.</b></p>
<b>Math</b>	<p>Geometry</p> <p>7.G.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.</p> <p>7.G.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.</p> <p>7.G.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.</p> <p>7.G.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.</p> <p>7.G.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.</p> <p>8.G.1 Verify experimentally the properties of rotations, reflections, and translations:</p> <p>8.G.1.a Lines are taken to lines, and line segments to line segments of the same length</p> <p>8.G.1.b Angles are taken to angles of the same measure.</p> <p>8.G.1.c Parallel lines are taken to parallel lines.</p> <p>8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.</p> <p>8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.</p> <p>8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.</p>
<b>Reading (AS)</b>	<p>AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.</p> <p>AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and</p>

	<p>analyze how specific word choices shape meaning or tone.</p> <p>AS.R.7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.*</p> <p>AS.R.10 Read and comprehend complex literary and informational texts independently and proficiently.</p>
<b>Science: NGSS</b>	<p>MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p> <p>MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p> <p>MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.</p>
<b>Social Studies</b>	<p>5.2.1 Create and Use research questions to guide inquiry on an issue or event.</p> <p>5.2.2 Evaluates the breadth of primary and secondary sources and analyzes notes to determine the need for additional information while researching an issue or event.</p> <p>5.3.1 Analyze and responds to multiple viewpoints on public issues brought forth in the context of a discussion.□</p>
<b>Speaking &amp; Listening (AS)</b>	<p>AS.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p> <p>AS.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.</p> <p>AS.SL.5 Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.</p>
<b>Writing</b>	<p>AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>

## UNIT/AREA OF EMPHASIS: Robotics (Automation & Robotics) – What Is Automation and Robotics?

### COMPONENTS AND ASSESSMENTS

**Performance Assessments:**

Portfolio  
Written Assessment  
Discussion Applications

**Leadership Alignment:**

- Students will be able to communicate with group members to build an automation and robotic system.

### *Standards and Competencies*

**Standard/Unit:**

What is Automation and Robotics

**Competencies**

**Total Learning Hours for Unit:** 10 Hours

- Describe the purpose of automation and robotics and its effect on society
- Summarize ways that robots are used in today's world and the impact of their use on society
- Describe positive and negative effects of automation and robotics on humans in terms of safety and economics
- Provide examples of STEM careers and the need for these professionals in our society

### *Aligned Washington State Core Standards (GLE Components and Anchor CCSS unless indicated otherwise)*

<b>Arts</b>	N/A
<b>Educational Technology</b>	2.4.1 Formulate and synthesize new knowledge.
<b>Health &amp; Fitness</b>	N/A
<b>Language (AS)</b>	AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
<b>Math</b>	N/A
<b>Reading (AS)</b>	AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. AS.R.7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
<b>Science: NGSS</b>	<b>MS-ETS1-1 Engineering Design</b> MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
<b>Social Studies</b>	4.2.3 Understand and analyze how technology and ideas have impacted Washington State or world history. 5.2.1 Create and use research questions to guide inquiry on an issue or event.
<b>Speaking &amp; Listening (AS)</b>	AS.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. AS.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

<b>Writing (AS)</b>	<p>AS.W.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.</p> <p>AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>AS.W.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.</p>
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## UNIT/AREA OF EMPHASIS: Robotics (Automation & Robotics) – Mechanical Systems

### COMPONENTS AND ASSESSMENTS

**Performance Assessments:**

Mechanism Investigations  
Project Problem-solving

**Leadership Alignment:**

- Students will engage in a problem solving process to build a robotic system.

### *Standards and Competencies*

**Standard/Unit:**

Mechanical Systems

**Competencies**

**Total Learning Hours for Unit: 20 Hours**

- Use ratios to solve mechanical advantage problems
- Use numerical and algebraic expressions and equations to solve real-life problems, such as gear ratios
- Use the characteristics of a specific mechanism to evaluate its purpose and applications
- Apply knowledge of mechanisms to solve a unique problem for speed, torque, force, or type of motion

### *Aligned Washington State Core Standards (GLE Components and Anchor CCSS unless indicated otherwise)*

<b>Arts</b>	N/A
<b>Educational Technology</b>	<p>1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.</p> <p>1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.</p> <p>1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.</p> <p>1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.</p> <p>2.2.1 Develop skills to use technology effectively.</p>
<b>Health &amp; Fitness</b>	N/A
<b>Language (AS)</b>	<p>AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.</p> <p>AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.</p> <p>AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.</p>
<b>Math</b>	<p>Ratios and Proportional Relationships</p> <p>7.rP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.</p> <p>7.rP.2 Recognize and represent proportional relationships between quantities.</p> <p>Expressions and Equations</p>

	7.ee.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
<b>Reading (AS)</b>	AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. AS.R.10 Read and comprehend complex literary and informational texts independently and proficiently.
<b>Science: NGSS</b>	<b>MS-PS3-1 Energy</b> MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. MS-PS3-2 Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. MS-PS3-4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. MS-PS3-5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. <b>MS-ETS1-1 Engineering Design</b> MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
<b>Social Studies</b>	N/A
<b>Speaking &amp; Listening (AS)</b>	AS.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. AS.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
<b>Writing (AS)</b>	AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**UNIT/AREA OF EMPHASIS: Robotics (Automation & Robotics) – Automated Systems**

**COMPONENTS AND ASSESSMENTS**

**Performance Assessments:**  
 Demonstration Check sheet(s)  
 Project Problem-solving  
 Project Rubrics

**Leadership Alignment**

- Students will work effectively in diverse teams as they participate in a TSA Robotics Challenge event components and activities integration

***Standards and Competencies***

**Standard/Unit:**  
 Automated Systems

**Competencies**

**Total Learning Hours for Unit:** 60 Hours

- Identify the seven technological resources and describe how they are integrated into an open and closed loop system
- Describe the purpose of pseudocode and comments within a computer program
- Explain how to use ratio reasoning to solve mechanical advantage problems
- Design, build, wire, and program both open and closed loop systems
- Use motors and sensors appropriately to solve robotic problems
- Troubleshoot a malfunctioning system using a methodical approach
- Experience fluid power by creating and troubleshooting a pneumatic device (FT Version)
- Design, build, wire and program a system operated by alternative energy (FT Version)
- Explain the roles and responsibilities of mechanical, electrical, and computer engineers who solve robotic problems

***Aligned Washington State Core Standards (GLE Components and Anchor CCSS unless indicated otherwise)***

<b>Arts</b>	N/A
<b>Educational Technology</b>	1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities. 1.2.1 Communicate and collaborate to learn with others. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning. 2.4.1 Formulate and synthesize new knowledge.
<b>Health &amp; Fitness</b>	N/A
<b>Language (AS)</b>	AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
<b>Math</b>	N/A

<b>Reading (AS)</b>	<p>AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.</p> <p>AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.</p> <p>AS.R.7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.*</p>
<b>Science: NGSS</b>	<p><b>MS-PS3-1 Energy</b></p> <p>MS-PS3-2 Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.</p> <p>MS-PS3-4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.</p> <p>MS-PS3-5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.</p> <p><b>MS-ETS1-1 Engineering Design</b></p> <p>MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p> <p>MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p> <p>MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved..</p>
<b>Social Studies</b>	N/A
<b>Speaking &amp; Listening (AS)</b>	<p>AS.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p>
<b>Writing (AS)</b>	<p>AS.W.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.</p> <p>AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>

## UNIT/AREA OF EMPHASIS: Medical Detectives (Science of Technology) – Applied Chemistry and Nanotechnology

### COMPONENTS AND ASSESSMENTS

**Performance Assessments:**

Product Application Rubric(s)

Problem Simulation(s)

**Leadership Alignment:**

- Students will participate in small diverse groups to problem solve within the TSA Technical Design event components and activities integration and/or TSA Leadership lesson.

### *Standards and Competencies*

**Standard/Unit:**

Applied Chemistry and Nanotechnology

**Competencies**

**Total Learning Hours for Unit: 20**

- Describe the difference between a chemist and a chemical engineer
- Apply science and engineering skills to create a product
- Follow the design process to create an adhesive
- Work with a team to solve an oil spill engineering simulation problem
- Demonstrate an understanding of how small a nanometer is
- Explore how nano-products are used in society today
- Identify tools and processes used to see and manipulate matter at the nanoscale
- Discuss the impact that nanotechnology has on their lives today and will have in the future

### *Aligned Washington State Core Standards (GLE Components and Anchor CCSS unless indicated otherwise)*

<b>Arts</b>	N/A
<b>Educational Technology</b>	1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.
	1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.
	1.2.1 Communicate and collaborate to learn with others.
	1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.
	1.3.2 Locate and organize information from a variety of sources and media.
	1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.
	1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.
	2.1.2 Practice ethical and respectful behavior.
	2.2.1 Develop skills to use technology effectively.
2.4.1 Formulate and synthesize new knowledge.	
<b>Health &amp; Fitness</b>	N/A
<b>Language (AS)</b>	AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
	AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
	AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
<b>Math</b>	N/A
<b>Reading (AS)</b>	AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.



<p><b>Science: NGSS</b></p>	<p><b>MS-PS1-1 Matter and its Interactions</b>  MS-PS1-6 Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*</p> <p><b>MS-PS2-1 Motion and Stability: Forces and Interactions</b>  MS-PS2-1 Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects.*  MS-PS2-2 Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the object and the mass of the object.</p> <p><b>MS-ESS3-1 Earth and Human Activity</b>  MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*</p> <p><b>MS-ETS1-1 Engineering Design</b>  MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.  MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.  MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.  MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.</p>
<p><b>Social Studies</b></p>	<p>N/A</p>
<p><b>Speaking &amp; Listening (AS)</b></p>	<p>AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.  AS.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.</p>
<p><b>Writing (AS)</b></p>	<p>AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>

**UNIT/AREA OF EMPHASIS: Medical Detectives (Science of Technology) – Applied Physics**

**COMPONENTS AND ASSESSMENTS**

**Performance Assessments:**  
 Machine Identification Demonstration  
 Design Problem Model  
 Product Analysis

**Leadership Alignment:**

- Students will participate in product analysis in small groups by participating in a TSA Technical Design event components and activities integration.

***Standards and Competencies***

**Standard/Unit:**  
 Applied Physics

**Competencies**

**Total Learning Hours for Unit: 25**

- Correctly identify the six simple machines and explain their applications
- Distinguish between the three classes of levers
- Identify a machine as something that helps use energy more efficiently
- Determine mechanical advantage from assembled simple machines
- Be able to compare and contrast kinetic and potential energy
- Predict the relative kinetic energy based on the mass and speed of the object
- Build, test, and evaluate a model of a design problem
- Analyze a product through testing methods and make modifications to the product

***Aligned Washington State Core Standards (GLE Components and Anchor CCSS unless indicated otherwise)***

<b>Arts</b>	N/A
<b>Educational Technology</b>	1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities. 1.2.1 Communicate and collaborate to learn with others. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry. 1.3.2 Locate and organize information from a variety of sources and media. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning. 2.4.1 Formulate and synthesize new knowledge.
<b>Health &amp; Fitness</b>	N/A
<b>Language (AS)</b>	AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
<b>Math</b>	Ratios and Proportional Relationships

	<p>7.rP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks <math>\frac{1}{2}</math> mile in each <math>\frac{1}{4}</math> hour, compute the unit rate as the complex fraction <math>\frac{1/2}{1/4}</math> miles per hour, equivalently 2 miles per hour.</p> <p>7.rP.2 Recognize and represent proportional relationships between quantities.</p> <p>7.rP.2.a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.</p> <p>The Number System</p> <p>7.nS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.</p> <p>Expressions and Equations</p> <p>7.ee.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p>
<b>Reading (AS)</b>	AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
<b>Science: NGSS</b>	<p><b>ETS1-1 Engineering Design</b></p> <p>MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p> <p>MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p> <p>MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p> <p>HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.</p>
<b>Social Studies</b>	N/A
<b>Speaking &amp; Listening (AS)</b>	AS.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
<b>Writing (AS)</b>	AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

## UNIT/AREA OF EMPHASIS: Medical Detectives – Exploring the Role

### COMPONENTS AND ASSESSMENTS

**Performance Assessments:**

Competency Demonstration Check sheet  
 Project Rubric(s)  
 Written Assessment

**Leadership Alignment**

- Students will have an opportunity to engage in ethics by making decisions about the biomedical process.

**Standards and Competencies**

**Standard/Unit:**  
What is a Medical Detective

**Competencies**

**Total Learning Hours for Unit:** 10 hours

- Measure vital signs including heart rate, blood pressure, and temperature
- Demonstrate the use of technology as an important tool in the Biomedical Sciences
- Explain the different ways a virus spreads through a population
- Describe the spread of a viral illness after inoculation is introduced
- Evaluate patient case files to diagnose the pathogen responsible for the patient's mystery illness
- Describe the steps that a medical professional will take to diagnose and treat a patient
- Provide examples how medical professionals contribute to the health and wellness of individuals

**Aligned Washington State Core Standards** (GLE Components and Anchor CCSS unless indicated otherwise)

<b>Arts</b>	N/A
<b>Educational Technology</b>	1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities. 1.2.1 Communicate and collaborate to learn with others.
<b>Health &amp; Fitness</b>	N/A
<b>Language (AS)</b>	AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
<b>Math</b>	The Number System 7.nS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. 7.nS.3 Solve real-world and mathematical problems involving the four operations with rational numbers.1 Expressions and Equations 7.ee.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. 7.ee.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
<b>Reading (AS)</b>	AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. AS.R.2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone. AS.R.7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
<b>Science: NGSS</b>	<b>MS-PS3-1 Energy</b> MS-PS3-4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
<b>Social Studies</b>	5.1.1 Understand evidence supporting a position on an issue or event.

	5.1.2 Evaluates the breadth of evidence supporting positions on an issue or event.
<b>Speaking &amp; Listening (AS)</b>	<p>AS.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.</p> <p>AS.SL.5 Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.</p> <p>AS.SL.6 Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.</p>
<b>Writing (AS)</b>	<p>AS.W.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.</p> <p>AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>AS.W.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.</p> <p>AS.W.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.</p> <p>AS.W.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 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.</p> <p>AS.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes.</p>

**UNIT/AREA OF EMPHASIS: Medical Detectives – Human Body Systems**

**COMPONENTS AND ASSESSMENTS**

**Performance Assessments:**

Competency Demonstration Check sheet  
 Project Rubric(s)  
 Written Assessment

**Leadership Alignment:**

- Students will problem solve and reason effectively by participating in a TSA Agriculture, Biotechnology OR Biotechnology Challenge event components and activities.

***Standards and Competencies***

**Standard/Unit:**

Human Body Systems

**Competencies**

**Total Learning Hours for Unit: 15 Hours**

- Describe how the brain collects and interprets input
- Compare and contrast the senses of hearing and sight, taste and smell and how they are collected and processed by the human body
- Identify major regions of the human brain
- Dissect a sheep's brain, accurately identifying and describing the function of the specified structures
- Compare and contrast the brains of a human and sheep
- Evaluate patient family history as part of a medical exam and create a pedigree

- Determine the probability of a child inheriting a genetic disease
- Use appropriate laboratory methods to isolate DNA from cheek cells
- Analyze how changes in the huntingtin gene affect the resulting protein and nerve cell function

**Aligned Washington State Core Standards** (GLE Components and Anchor CCSS unless indicated otherwise)

<b>Arts</b>	N/A
<b>Educational Technology</b>	<p>1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.</p> <p>1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.</p> <p>1.2.1 Communicate and collaborate to learn with others.</p> <p>1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures.</p> <p>1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.</p> <p>1.3.2 Locate and organize information from a variety of sources and media.</p> <p>1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.</p> <p>1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.</p> <p>2.1.1 Practice personal safety.</p> <p>2.1.2 Practice ethical and respectful behavior.</p> <p>2.2.1 Develop skills to use technology effectively.</p> <p>2.2.2 Use a variety of hardware to support learning.</p> <p>2.4.1 Formulate and synthesize new knowledge.</p>
<b>Health &amp; Fitness</b>	N/A
<b>Language (AS)</b>	AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
<b>Math</b>	<p>The Number System</p> <p>7.nS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</p> <p>7.nS.3 Solve real-world and mathematical problems involving the four operations with rational numbers.1</p> <p>Expressions and Equations</p> <p>7.ee.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p>
<b>Reading (AS)</b>	<p>AS.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.</p> <p>AS.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.</p> <p>AS.R.7 Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.*</p> <p>AS.R.10 Read and comprehend complex literary and informational texts independently and proficiently.</p>
<b>Science: NGSS</b>	<p><b>MS-LS1-1 From Molecules to Organisms: Structures and Processes</b></p> <p>MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.</p> <p>MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</p> <p>MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.</p> <p><b>MS-LS3-1 Heredity: Inheritance and Variation of Traits</b></p>

	MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
<b>Social Studies</b>	N/A
<b>Speaking &amp; Listening (AS)</b>	AS.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. AS.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. AS.SL.5 Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
<b>Writing (AS)</b>	AS.W.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. AS.W.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. AS.W.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. AS.W.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 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. AS.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

## UNIT/AREA OF EMPHASIS: Medical Detectives – Solving the Mystery of Death

### COMPONENTS AND ASSESSMENTS

**Performance Assessments:**  
Autopsy Project Evaluation

**Leadership Alignment:**

- Students will problem solve with small groups to solve a TSA Agriculture, Biotechnology OR Biotechnology Challenge event components and activities such as solving a murder mystery.

### *Standards and Competencies*

**Standard/Unit:**  
Murder Mystery

**Competencies**

**Total Learning Hours for Unit: 20 hours**

- Demonstrate how to use patient and ambient temperature to identify the time of death
- Demonstrate how to use the time of death information to identify suspects
- List the steps of an autopsy
- Analyze a portion of an autopsy report to determine the cause of death for a murder victim
- Use DNA gel electrophoresis to compare DNA samples
- Defend identification of suspect using physical evidence including time of death, cause of death, and DNA crime scene analysis

***Aligned Washington State Core Standards (GLE Components and Anchor CCSS unless indicated otherwise)***

**Arts** N/A

<b>Educational Technology</b>	<p>1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools.</p> <p>1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.</p> <p>1.2.1 Communicate and collaborate to learn with others.</p> <p>1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.</p> <p>1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.</p> <p>1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.</p> <p>2.1.2 Practice ethical and respectful behavior.</p> <p>2.2.1 Develop skills to use technology effectively.</p> <p>2.4.1 Formulate and synthesize new knowledge.</p>
<b>Health &amp; Fitness</b>	N/A
<b>Language (AS)</b>	<p>AS.L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.</p> <p>AS.L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.</p> <p>AS.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.</p>
<b>Math</b>	<p>The Number System</p> <p>7.nS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</p> <p>7.nS.3 Solve real-world and mathematical problems involving the four operations with rational numbers.1</p> <p>Expressions and Equations</p> <p>7.ee.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p> <p>7.ee.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.</p> <p>8.ee.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.</p>
<b>Reading (AS)</b>	N/A
<b>Science: NGSS</b>	<p><b>MS-LS4-1 Biological Evolution: Unity and Diversity</b></p> <p>MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.</p>
<b>Social Studies</b>	<p>5.2.1 Create and use research questions to guide inquiry on an issue or event.</p> <p>5.2.2 Evaluates the breadth of primary and secondary sources and analyzes notes to determine the need for additional information while researching an issue or event.</p> <p>5.4.1 Analyze multiple factors, makes generalizations, and interprets primary sources to formulate a thesis in a paper or presentation</p>
<b>Speaking &amp; Listening (AS)</b>	<p>AS.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.</p> <p>AS.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.</p> <p>AS.SL.5 Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.</p> <p>AS.SL.6 Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.</p>
<b>Writing (AS)</b>	AS.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and



	<p>audience.</p> <p>AS.W.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.</p> <p>AS.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.</p> <p>AS.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes.</p>
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**21<sup>st</sup> Century Skills**

Check those that students will demonstrate in this course:

<p><b>LEARNING &amp; INNOVATION</b></p> <p><b>Creativity and Innovation</b></p> <p><input checked="" type="checkbox"/> Think Creatively</p> <p><input checked="" type="checkbox"/> Work Creatively with Others</p> <p><input checked="" type="checkbox"/> Implement Innovations</p> <p><b>Critical Thinking and Problem Solving</b></p> <p><input checked="" type="checkbox"/> Reason Effectively</p> <p><input checked="" type="checkbox"/> Use Systems Thinking</p> <p><input checked="" type="checkbox"/> Make Judgments and Decisions</p> <p><input checked="" type="checkbox"/> Solve Problems</p> <p><b>Communication and Collaboration</b></p> <p><input checked="" type="checkbox"/> Communicate Clearly</p> <p><input checked="" type="checkbox"/> Collaborate with Others</p>	<p><b>INFORMATION, MEDIA &amp; TECHNOLOGY SKILLS</b></p> <p><b>Information Literacy</b></p> <p><input checked="" type="checkbox"/> Access and /evaluate Information</p> <p><input checked="" type="checkbox"/> Use and Manage Information</p> <p><b>Media Literacy</b></p> <p><input type="checkbox"/> Analyze Media</p> <p><input checked="" type="checkbox"/> Create Media Products</p> <p><b>Information, Communications and Technology (ICT Literacy)</b></p> <p><input checked="" type="checkbox"/> Apply Technology Effectively</p>	<p><b>LIFE &amp; CAREER SKILLS</b></p> <p><b>Flexibility and Adaptability</b></p> <p><input checked="" type="checkbox"/> Adapt to Change</p> <p><input checked="" type="checkbox"/> Be Flexible</p> <p><b>Initiative and Self-Direction</b></p> <p><input checked="" type="checkbox"/> Manage Goals and Time</p> <p><input checked="" type="checkbox"/> Work Independently</p> <p><input checked="" type="checkbox"/> Be Self-Directed Learners</p> <p><b>Social and Cross-Cultural</b></p> <p><input checked="" type="checkbox"/> Interact Effectively with Others</p> <p><input checked="" type="checkbox"/> Work Effectively in Diverse Teams</p> <p><b>Productivity and Accountability</b></p> <p><input checked="" type="checkbox"/> Manage Projects</p> <p><input checked="" type="checkbox"/> Produce Results</p> <p><b>Leadership and Responsibility</b></p> <p><input checked="" type="checkbox"/> Guide and Lead Others</p> <p><input checked="" type="checkbox"/> Be Responsible to Others</p>
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