



Statewide Framework Document for:

**030198 Climate Science Engineering and Technology**

Standards may be added to this document prior to submission but may not be removed from the framework to meet state credit equivalency requirements. Performance assessments may be developed at the local level. In order to earn state approval, performance assessments must be submitted within this framework. **This course is eligible for 1 credit of laboratory science.** The Washington State Science Standards performance expectations for high school blend core ideas (Disciplinary Core Ideas, or DCIs) with scientific and engineering practices (SEPs) and crosscutting concepts (CCCs) to support students in developing usable knowledge that can be applied across the science disciplines. These courses are to be taught in a three-dimensional manner. The details about each performance expectation can be found at Next Generation Science Standards, and the supporting evidence statements can be found under Resources.

School District	
<b>Course Title:</b> Climate Science: Engineering and Technology	<b>Total Framework Hours:</b> 180
<b>CIP Code:</b> 030198 <input checked="" type="checkbox"/> Exploratory <input type="checkbox"/> Preparatory	<b>Date Last Modified:</b> March 12, 2021
<b>Career Cluster:</b> Science, Technology, Engineering and Math	<b>Cluster Pathway:</b> Engineering and Technology
<b>Eligible for Equivalent Credit in:</b> Science	<b>Total Number of Units:</b> 10
<p><b>Course Summary:</b> The Climate Science Engineering and Technology course examines the complexities of a changing climate, its impacts on physical and living systems, and emergent solutions that focus on engineering and technological responses. At the end of the course, students will engage in a final project focused on an aspect of climate resilience. Topics include: understanding climate science dynamics, locating and calculating carbon in the living and physical environments, carbon management, industrial ecology, dynamics of climate impacts on health, processes that lead towards sustainable and innovative carbon management, effective local, state, national, and global policies, and effective communication design.</p> <p><b>Unit 1:</b> Meet the Problem  <b>Unit 2:</b> Systems Thinking  <b>Unit 3:</b> Atmospheric Systems  <b>Unit 4:</b> Fundamentals of Engineering in Carbon Management  <b>Unit 5:</b> Industrial Ecology  <b>Unit 6:</b> Transportation Systems  <b>Unit 7:</b> Agricultural Systems  <b>Unit 8:</b> Health Systems  <b>Unit 9:</b> Policy and Communication  <b>Unit 10:</b> Climate Resilience/The Final Project</p>	

**Course Resources:**

<https://carbonengineering.com/>

<http://what-when-how.com/energy-engineering/carbon-sequestration-energy-engineering/>

<https://www.doh.wa.gov/CommunityandEnvironment/ClimateandHealth>

<http://sustainabledevelopment.un.org>

<https://www.noaa.gov/climate>

<https://www.stakeholdermap.com/climate-change-stakeholders.html>

**Unit 1: Meet the Problem****Total Learning Hours for Unit: 15**

**Unit Summary:** In this unit students understand the nature of climate science and discover their role locally and globally within the climate system, e.g. self-evaluation of personal carbon footprint.

- Review and revisit the major components of the climate science system, including but not limited to hydrosphere, atmosphere, biosphere, and lithosphere, and the cycling of carbon among/between them.
- Using evidence developed from locally relevant case studies, students evaluate individual and community contributions to a changing climate.
- Data will be used to critically evaluate sources of information\*.
- Observe changes in climate systems, such as biogeochemical cycles.

Students receive an outline of the course and be introduced to Climate Resilience- The Final Project looking through the lens of a specific unit topic.

\*This is an opportunity for students to practice SEP 7, Engaging in Argument from Evidence:

- Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.
- Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

- Use a carbon footprint calculator to calculate personal carbon footprint, school footprint, and/or embodied carbon footprint.
- Research and present current technologies and current events related to climate change in their community.
- Research and propose questions about emergent practices, industrial, community-based, and personal, which mitigate climate change impacts.
- Analyze different sources of climate science data and construct an argument that supports their analysis.
- Construct a communications analysis to how information is conveyed via news sources, social media to identify bias.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Students take a stance on one of the provided current technologies or industries that will mitigate climate change and present it to the class with researched, substantive support.

1.A.1 Use a wide range of idea creation techniques (such as brainstorming).

1.B.2 Be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work.

3.A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts.

3.A.2 Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions.

4.A.1 Access information efficiently (time) and effectively (sources).

4.B.1 Use information accurately and creatively for the issue or problem at hand.

9.B Work effectively in diverse teams.

## Industry Standards and/or Competencies

**Resource:** International Technology and Engineering Educators Association:

<https://www.iteea.org/File.aspx?id=67767&v=b26b7852>

Note: Standards are listed as stated by ITEEA and not listed numerically or alphabetically.

1. Students will develop an understanding of the characteristics and scope of technology.
  - L. Inventions and innovations are the results of specific, goal-directed research.
  - M. Most development of technologies these days is driven by the profit motive and the market.
2. Students will develop an understanding of the core concepts of technology.
  - W. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.
  - X. Systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.
  - Y. The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop.
  - AA. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development.
5. Students will develop an understanding of the effects of technology on the environment.
  - G. Humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing, and recycling.
  - J. The alignment of technological processes with natural processes maximizes performance and reduces negative impacts on the environment.
  - K. Humans devise technologies to reduce the negative consequences of other technologies.
6. Students will develop an understanding of the role of society in the development and use of technology.
  - I. The decision whether to develop a technology is influenced by societal opinions and demands, in addition to corporate cultures.

## Aligned Washington State Academic Standards

<b>Science</b>	HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.	
<b>Science and Engineering Practice</b>	<b>Disciplinary Core Idea</b>	<b>Crosscutting Concept</b>
Developing and Using Models	ESS1.B: Earth and the Solar System ESS2.A: Earth Materials and Systems ESS2.D: Weather and Climate	Cause and Effect

**Unit 2: Systems Thinking****Total Learning Hours for Unit: 15**

**Unit Summary:** In this unit, students learn how to think in terms of complex systems. This type of thinking is much different than our typical understanding of issues. It is important to visualize systems using models such as stock and flow diagrams.

- The basics of a systems diagram, explain and modify simple examples (such as the bathtub example below), learn to create their own systems diagram, and apply this understanding to climate science.
- Apply their understanding of systems thinking by using locally relevant, climate-specific examples such as sea level rise and coastal flooding, drought and wildfires, or snow-pack reduction and melting glaciers.
- Systems thinking is relevant as it allows for a broader more holistic understanding of an issue in order to identify problems, their causes, potential solutions, and unintended consequences.

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

- Model the components of a system using an example provided in class.
- Construct an explanation based on evidence that identifies boundaries and conditions of the system.
- Provide an explanation that defines the system's inputs and outputs.
- Evaluate with evidence how cause and effect results in changes in the system.
- Use the system model to predict change across time.
- Utilize Geographical Information Systems (GIS) to demonstrate at least three intersecting components of a locally relevant climate related issue
- Use computational thinking to describe how positive and negative feedback can stabilize or destabilize a system.
- Analyze using data about how designed systems, such as LEAN Management Systems, can result in greater efficiency.
- Social responsibility - Just because you can, should you? Define and evaluate the cause and effect of the impact of changes resulting from personal and community decisions and choices.
- Participate in local public forums and community decision making processes; record thought processes that lead to (student's) comments on a public decision.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Students participate in local public forums and community decision making processes; record thought processes that lead to (student's) comments on a public decision.
- Students demonstrate an understanding of complex inter-relationships (systems). This means that the student understands social, organizational, and technological systems; they can monitor and correct performance; and they can design or improve systems.
- Students demonstrate the ability to acquire and use information in a family, community, business and industry settings. This means that the student can acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information.

2.B Use Systems Thinking

2.B.1: Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

4.A Access and Evaluate Information

**Industry Standards and/or Competencies:****Resource:** International Technology and Engineering Educators Association:<https://www.iteea.org/File.aspx?id=67767&v=b26b7852>

Note: Standards are listed as stated by ITEEA and not listed numerically or alphabetically.

1. Students will develop an understanding of the characteristics and scope of technology.
  - L. Inventions and innovations are the results of specific, goal-directed research.
  - M. Most development of technologies these days is driven by the profit motive and the market.
2. Students will develop an understanding of the core concepts of technology.
  - W. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.
  - X. Systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.
  - Y. The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop.
  - AA. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development.
5. Students will develop an understanding of the effects of technology on the environment.
  - G. Humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing, and recycling.
  - J. The alignment of technological processes with natural processes maximizes performance and reduces negative impacts on the environment.
  - K. Humans devise technologies to reduce the negative consequences of other technologies.

**Aligned Washington State Academic Standards**

<b>Science</b>	HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. HS-ESS3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
----------------	---

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Analyzing and Interpreting Data Using Mathematics and Computational Thinking	ESS2.A: Earth Materials and Systems ESS2.D: Weather and Climate ESS3.D: Global Climate Change	Stability and Change Influence of Science, Engineering, and Technology on Society and the Natural World Systems and System Models

**Unit 3: Atmospheric Systems****Total Learning Hours for Unit: 20****Unit Summary:** In this unit, students learn that human activities affect the movement of carbon and other atmospheric gases around the world.

- Understand the industrial revolution significantly changed the global carbon cycle.
- Understand atmospheric gases change the thermal conductance of the atmosphere, the chemistry of ocean water and changing ocean currents.
- Explore the major sources and sinks of carbon and other atmospheric gases.
- Understand that human impact on Earth's carbon cycle is influencing and altering the balance between the atmosphere, terrestrial systems, and the oceans.

**Performance Assessments:** (Districts to complete for each unit)*Example assessments for this unit include:*

- Construct an argument supporting methods used to show evidence of changes to the carbon (or other atmospheric gas) cycle and connections between these changes and climate change (e.g. ice core carbon analysis).
- Research and communicate historical and current information including Indigenous perspectives (e.g. little ice age and the carbon cycle), human impact on earth systems (time scales - geologic history, human recorded history, other scales).
- Construct an argument supporting strategies or processes to modify personal and/or community behavior(s) to ensure environmental survival.
- Evaluate the efficacy of different technologies used to assess historical carbon and climate data, e.g. paleoclimatology, ice core data, dendrochronology. <https://www.usgs.gov/centers/gecsc/science/paleoclimate>
- Revisit and revise the earth systems model from unit 2 (e.g. use a computer system to model the impacts of different changes to the flows of the system).
- Analyze the constraints of a designed system or solutions.
- Use a model to describe how variations in the amount of carbon (or other greenhouse gases) and the flow of energy into and out of Earth's systems result in changes in climate.
- Create a model that shows the interaction between atmospheric changes and human activity. Address science, technology, society, environment, economics, and ethics in your model. This model is a formative assessment piece and should be iterated on across time and over the duration of the course.

<https://www.propublica.org/article/welcome-to-cancer-alley-where-toxic-air-is-about-to-get-worse>**Leadership Alignment:** (Districts to complete for each unit)*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.**Example:*

- Research and communicate historical and current information including Indigenous perspectives (e.g. little ice age and the carbon cycle), human impact on earth systems (time scales - geologic history, human recorded history, other scales).

6.A.3 Applying a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.

12. A Having Global Awareness.

12.A.1 Using 21st century skills to understand and address global issues.

12.A.2 Learning from and working collaboratively with individuals representing diverse cultures, religions and lifestyles in a spirit of mutual respect and open dialogue in personal, work and community contexts.

12.A.3 Understanding other nations and cultures, including the use of non-English languages.

12.E Having Environmental Literacy.

12.E.1 Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water and ecosystems.

12.E.2 Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.)

**Industry Standards and/or Competencies:**

**Resource:** International Technology and Engineering Educators Association:

<https://www.iteea.org/File.aspx?id=67767&v=b26b7852>

Note: Standards are listed as stated by ITEEA and not listed numerically or alphabetically.

2. Students will develop an understanding of the core concepts of technology.

Z. Selecting resources involves trade-offs between competing values, such as availability, cost, desirability, and waste.

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

H. Changes caused by the use of technology can range from gradual to rapid and from subtle to obvious.

I. Making decisions about the use of technology involves weighing the trade-offs between the positive and negative effects.

J. Ethical considerations are important in the development, selection, and use of technologies.

K. The transfer of a technology from one society to another can cause cultural, social, economic, and political changes affecting both societies to varying degrees.

5. Students will develop an understanding of the effects of technology on the environment.

G. Humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing, and recycling.

H. When new technologies are developed to reduce the use of resources, considerations of trade-offs are important.

I. With the aid of technology, various aspects of the environment can be monitored to provide information for decision making.

J. The alignment of technological processes with natural processes maximizes performance and reduces negative impacts on the environment.

K. Humans devise technologies to reduce the negative consequences of other technologies.

L. Decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment.

7. Students will develop an understanding of the influence of technology on history.

**Aligned Washington State Academic Standards**

**Science**

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.



Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Developing and Using Models	PS3.D: Energy in Chemical Processes and Everyday Life LS2.B: Cycles of Matter and Energy Transfer in Ecosystems ESS1.B: Earth and the Solar System ESS2.A: Earth Materials and Systems ESS2.D: Weather and Climate	Systems and System Models Cause and Effect

**Unit 4: Fundamentals of Engineering in Carbon Management****Total Learning Hours for Unit: 20**

**Unit Summary:** In this unit, students develop a quantitative model to describe the movement of carbon between the atmosphere, lithosphere, hydrosphere, and biosphere.

- Research solutions that mitigate or reduce carbon emissions.
- Examine the carbon atom related to carbon sequestration, and evaluate or refine solutions that would impact the carbon cycle by increasing biological or mechanical carbon sequestration and storage\*relative to carbon emissions.
- Consideration of embodied carbon for materials used in the design process should be included.
- Apply problem-solving skills and knowledge of research and engineering to **design, implement, test, and communicate their solutions.**
- Evaluate or refine a technological solution that reduces impacts of carbon emissions on the biosphere, atmosphere, hydrosphere, or lithosphere.

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

- Use existing computer carbon modeling tools to analyze the impacts of different types of carbon sequestration (high tech and low tech) (e.g. <https://www.climateinteractive.org/tools/en-roads/>).
- Research real world examples of how engineers are addressing carbon sequestration and storage or the reduction of greenhouse gas emissions (e.g. improving the fuel efficiency of vehicles, adding bike lanes to reduce the number of vehicles on the road), and then propose/design their own solution or implementation ideas for their local communities.) May include local and county policy which govern reuse/renew/take-back rules.
- Research and communicate the life cycles of products and/or buildings, and the embodied energy of them through a comparative analysis of various building components (e.g. timber structure vs. steel structure vs. cement/concrete) or agricultural products (e.g. choosing locally produced food vs. food from afar, regenerative soil systems).
- Propose and engineer a mitigation solution that reduces building or agricultural impacts from energy use (e.g. methane capture and reuse, greywater or blackwater capture and reuse, regenerative soil amendments).
- Evaluate or refine a low-tech or high-tech solution by first breaking down a climate-related community problem into smaller components and selecting a manageable problem to address.

**Resources:** [Living Building Challenge](#); Leadership in Energy Efficient Design; City/County/State building codes; City/County planning ordinances; 2030 District

<https://carbonleadershipforum.org/projects/ec3-methodology/>

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Students will record their own carbon emission growth and then meet with a classroom group that will then total the groups total emissions and then hypothesize ways in which they can diminish their impact though efforts.

11.B.1 Act responsibly with the interests of the larger community in mind.

- 1B. Work Creatively with others - 1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes.
- 12.E Having Environmental Literacy.
- 12.E.1 Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water and ecosystems.

**Industry Standards and/or Competencies:**

**Resource:** International Technology and Engineering Educators Association:

<https://www.iteea.org/File.aspx?id=67767&v=b26b7852>

Note: Standards are listed as stated by ITEEA and not listed numerically or alphabetically.

5. Students will develop an understanding of the effects of technology on the environment.
- K. Humans devise technologies to reduce the negative consequences of other technologies.
8. Students will develop an understanding of the attributes of design.
- H. The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.
- I. Design problems are seldom presented in a clearly defined form.
- J. The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved.
- K. Requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other.

**Aligned Washington State Academic Standards**

<b>Science</b>	<p>HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.</p> <p>HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.</p>
----------------	--

<b>Science and Engineering Practice</b>	<b>Disciplinary Core Idea</b>	<b>Crosscutting Concept</b>
<p>Developing and Using Models</p> <p>Constructing Explanations and Designing Solutions</p>	<p>ESS2.D: Weather and Climate</p> <p>ESS3.C: Human Impacts on Earth Systems</p> <p>ETS1.B: Developing Possible Solutions</p>	<p>Energy and Matter</p> <p>Stability and Change</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World</p>

**Unit 5: Industrial Ecology****Total Learning Hours for Unit: 20**

**Unit Summary:** In this unit, students explore the needs, impacts, and potential changes to industrial processes that make modern society function.

- Analyze the costs and benefits (economic, environmental, social, cultural) of these processes and look for ways to improve them.
- Involvement of multidisciplinary fields of ecology, engineering, economics, social sciences and more.
- Observe the built environment of their school and community, identify common problems such as heating and cooling and then look for/research and identify **sustainable design solutions**.
- Evaluate a range of potential/competing solutions to industrial/commercial building design problems and devise a plan to apply one of the previously researched solutions in their local community (including cost/benefit analysis).
- Include projects for: green building design, climate-friendly landscaping, life cycle analysis of products, conscientious consumerism, and cost-benefit analysis.

\*Industrial ecology is a study of how natural materials and energy are extracted, transformed and flow through human industrial systems.

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

- Develop a technological solution to building materials - model energy efficient design.
- Use an online model (such as iTree) to consider the role of tree planting in adding shade to reduce cooling costs.
- Analyze the systems in their school (food, energy, water, or other systems) to determine where waste occurs, and how to reduce the waste generated by the school. Students design a project to reduce waste or improve efficiency of school systems (e.g. drought tolerant landscapes to reduce water waste, composting programs to reduce food waste, energy conservation tools or programs to reduce energy waste).
- Analyze a design cycle to consider how waste products in one industrial cycle could be used as an input for another design system (e.g. methane from landfills or sewers can be flared off (waste) or captured and used as an energy source, or a company sells its waste product to another company that uses it as an input - food waste is collected and made into compost for sale as a soil amendment).
- Examine a community opportunity to reimagine and/or design alternative systems for waste, energy, transit and provide alternative solutions to a local business/community/town council/school board.

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Students examine a community opportunity to reimagine and/or design alternative systems for waste, energy, transit and provide alternative solutions to a local business/community/town council/school board.

3b Collaborate with Others

1.C Implement Innovations: Student Outcome: The student will demonstrate skills that assist in understanding and accepting responsibility to family, community, and business and industry.

1.C.1 Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur.

- 10. Productivity and Accountability
- 10.A Manage Products
- 10.A.1 Set and meet goals, even in the face of obstacles and competing pressures
- 10.A.2 Prioritize, plan and manage work to achieve the intended result
- 12E. Environmental Literacy
- 12.E.4 Investigate and analyze environmental issues, and make accurate conclusions about effective solutions

**Industry Standards and/or Competencies:**

**Resource:** International Technology and Engineering Educators Association:

<https://www.iteea.org/File.aspx?id=67767&v=b26b7852>

Note: Standards are listed as stated by ITEEA and not listed numerically or alphabetically.

- 5. Students will develop an understanding of the effects of technology on the environment.
- H. When new technologies are developed to reduce the use of resources, considerations of trade-offs are important.
- 6. Students will develop an understanding of the role of society in the development and use of technology.
- I. The decision whether to develop a technology is influenced by societal opinions and demands, in addition to corporate cultures.
- 8. Students will develop an understanding of the attributes of design.
- H. The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.

**Aligned Washington State Academic Standards**

<b>Science</b>	HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	
<b>Science and Engineering Practice</b>	<b>Disciplinary Core Idea</b>	<b>Crosscutting Concept</b>
Engaging in Argument from Evidence Constructing Explanations and Designing Solutions	ESS3.A: Natural Resources ETS1.B: Developing Possible Solutions ESS3.C: Human Impacts on Earth Systems	Influence of Science, Engineering, and Technology on Society and the Natural World Science Addresses Questions About the Natural and Material World Stability and Change

<b>Unit 6:</b> Transportation Systems	<b>Total Learning Hours for Unit:</b> 15
<p><b>Unit Summary:</b> In this unit, students explore the ways in which the transport sector is the fastest growing contributor to carbon-based emissions.</p> <ul style="list-style-type: none"> <li>● Understand that growth in energy use is higher for transportation than any other end-use sector.</li> <li>● Research and design possible solutions to reduce transportation's (maritime, rail, roadway, airplanes) contribution to long-lived carbon dioxide (CO<sub>2</sub>) emissions and short-lived black carbon generated primarily by diesel vehicles.</li> <li>● Apply the engineering design cycle to a community transportation problem in order to address the impacts of climate change on ecosystems.</li> </ul>	
<p><b>Performance Assessments:</b> (Districts to complete for each unit)</p> <p><i>Example assessments for this unit include:</i></p> <ul style="list-style-type: none"> <li>● Explore online data sets to examine sources of carbon-based emissions from transportation</li> <li>● Design, evaluate, and refine a solution to reduce carbon-based emissions from transportation</li> <li>● Create or revise a simulation to mitigate adverse impacts of transportation related carbon-based emissions</li> <li>● Compare impacts of different types of transportation sources (e.g. electric vs diesel vehicles vs public transportation vs solar-powered car) and consider the cost/benefit ratio of their chosen technology</li> <li>● Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy</li> </ul>	
<p><b>Leadership Alignment:</b> (Districts to complete for each unit)</p> <p><i>Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.</i></p> <p><i>Example:</i></p> <ul style="list-style-type: none"> <li>● Design, evaluate, and refine a solution to reduce carbon-based emissions from transportation</li> <li>● Create or revise a simulation to mitigate adverse impacts of transportation related carbon-based emissions</li> </ul> <p>11. Leadership and Responsibility</p> <p>11.A Guide and Lead Others</p> <p>11.A.1 Use interpersonal and problem-solving skills to influence and guide others toward a goal</p> <p>11.A.2 Leverage strengths of others to accomplish a common goal</p> <p>11.A.3 Inspire others to reach their very best via example and selflessness</p> <p>11.A.4 Demonstrate integrity and ethical behavior in using influence and power</p> <p>11.B Be Responsible to Others</p> <p>11.B.1 Act responsibly with the interests of the larger community in mind</p> <p>12.E Environmental Literacy</p> <p>12.E.4 Take individual and collective action towards addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues)</p>	
<p><b>Industry Standards and/or Competencies:</b></p> <p><b>Resource:</b> International Technology and Engineering Educators Association:  <a href="https://www.iteea.org/File.aspx?id=67767&amp;v=b26b7852">https://www.iteea.org/File.aspx?id=67767&amp;v=b26b7852</a></p>	

Note: Standards are listed as stated by ITEEA and not listed numerically or alphabetically.

- 5. Students will develop an understanding of the effects of technology on the environment.
- H. When new technologies are developed to reduce the use of resources, considerations of trade-offs are important.
- 6. Students will develop an understanding of the role of society in the development and use of technology.
- I. The decision whether to develop a technology is influenced by societal opinions and demands, in addition to corporate cultures.
- 8. Students will develop an understanding of the attributes of design.
- H. The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.
- 18. Students will develop an understanding of and be able to select and use transportation technologies.
- J. Transportation plays a vital role in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.
- K. Intermodalism is the use of different modes of transportation, such as highways, railways, and waterways, as part of an interconnected system that can move people and goods easily from one mode to another.
- L. Transportation services and methods have led to a population that is regularly on the move.
- M. The design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.

Aligned Washington State Academic Standards		
<b>Science</b>	HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Engaging in Argument from Evidence Using Mathematics and Computational Thinking	ESS3.A: Natural Resources ETS1.B: Developing Possible Solutions ESS3.C: Human Impacts on Earth Systems	Influence of Science, Engineering, and Technology on Society and the Natural World Science Addresses Questions About the Natural and Material World Stability and Change Science Is a Human Endeavor

**Unit 7: Agricultural Systems****Total Learning Hours for Unit: 20****Unit Summary:** In this unit, it is expected that students understand agricultural systems as a major aspect of climate science learning.

- Explore content supporting agricultural sustainable land use practices, aquaculture, food systems, location of agricultural production, and the impact on the natural world.
- Agricultural impacts will be measured in terms of chemical use, water quality and conservation, biofuels, carbon sequestration, and more.
- Explore problems and potential solutions in agriculture, to ensure a sustainable future.
- Research the impacts of a changing climate and/or increased record (extreme) weather events on local agricultural systems.
- Use **modeling and prediction to develop and propose solutions to a changing climate that impacts agricultural production.** (For the purposes of this unit, system exploration is limited to production and harvesting [transport, storage, and distribution connections can be made in other units].)

**Performance Assessments:** (Districts to complete for each unit)*Example assessments for this unit include:*

- Research and explore new ideas for biofuels. This would include creating a sample of the biofuel to be used in an agricultural system.
- Research and evaluate seasonal changes in crop production systems.
- Investigate agricultural systems that contribute to climate change, including but not limited to: methane production, fertilizer production and use, no till systems, till systems, air quality, water quality, soil health, and more.
- Compare different agricultural practices in terms of carbon sequestration (e.g. regenerative agricultural versus conventional agricultural practices).
- Explore the potential of soil (soil microbes) to sequester and store carbon and will explore what agricultural practices take advantage of this understanding.
- Research and communicate an example of the impact of a changing climate on agriculture (e.g. shifting climatic zones, changing diseases and disease vectors like the pine bark beetle impacting Washington forests).

**Leadership Alignment:** (Districts to complete for each unit)*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.**Example:*

- Research and explore new ideas for biofuels. This would include creating a sample of the biofuel to be used in an agricultural system.
- Research and communicate an example of the impact of a changing climate on agriculture (e.g. shifting climatic zones, changing diseases and disease vectors like the pine bark beetle impacting Washington forests).
- Investigate agricultural systems that contribute to climate change, including but not limited to: methane production, fertilizer production and use, no till systems, till systems, air quality, water quality, soil health, and more.

12.E Environmental Literacy

12.E.1 Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water and ecosystems

12.B Financial, Economic, Business, and Entrepreneurial Literacy

12.B.2 Understanding the role of the economy in society

4.B Use and Manage Information



4.B.1 Use information accurately and creatively for the issue or problem at hand

4.B.2 Manage the flow of information from a wide variety of sources

**Industry Standards and/or Competencies:**

**Resource:** International Technology and Engineering Educators Association:

<https://www.iteea.org/File.aspx?id=67767&v=b26b7852>

Note: Standards are listed as stated by ITEEA and not listed numerically or alphabetically.

2. Students will develop an understanding of the core concepts of technology.

W. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.

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

H. Changes caused by the use of technology can range from gradual to rapid and from subtle to obvious.

I. Making decisions about the use of technology involves weighing the trade-offs between the positive and negative effects.

J. Ethical considerations are important in the development, selection, and use of technologies.

5. Students will develop an understanding of the effects of technology on the environment.

G. Humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing, and recycling.

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

K. Agriculture includes a combination of businesses that use a wide array of products and systems to produce, process, and distribute food, fiber, fuel, chemicals, and other useful products.

L. Biotechnology has applications in such areas as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment, and genetic engineering.

M. Conservation is the process of controlling soil erosion, reducing sediment in waterways, conserving water, and improving water quality.

N. The engineering design and management of agricultural systems require knowledge of artificial ecosystems and the effects of technological development on flora and fauna.

**Aligned Washington State Academic Standards**

<b>Science</b>	HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
----------------	---

<b>Science and Engineering Practice</b>	<b>Disciplinary Core Idea</b>	<b>Crosscutting Concept</b>
Constructing Explanations and Designing Solutions Using Mathematics and Computational Thinking	ESS3.C: Human Impacts on Earth Systems ETS1.B: Developing Possible Solutions	Stability and Change Influence of Science, Engineering, and Technology on Society and the Natural World Science Is a Human Endeavor

**Unit 8: Health Systems****Total Learning Hours for Unit: 20**

**Unit Summary:** In this unit, the student understands the impact of climate science and changing climate impacts on human and ecosystem health.

- Understand that climate change impacts include air pollution, changes in vector ecology, increasing allergens, water quality impacts, water and food supply impacts, environmental degradation, and extreme weather events.
- Explore possible solutions to our current health system issues.
- Use computer models to simulate impacts of climate change on ecosystem and/or human health, and design alternate scenarios to address these impacts.

\*Note to teacher: Vector ecology is connecting ecology and pathogen transmission in a global environment. Vector ecology could include a study of how the carriers of diseases such as Lyme disease, West Nile Virus, Malaria, etc. are shifting habitat as a result of a changing climate.

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

- Explore data sets related to global and local human health (e.g. identifying populations that bear a disproportionate burden from poor air quality - environmental racism).
- Review projected impacts on ecosystem and human health resulting from climate change, e.g. through climate assessments reports.
- Consider the role of unintended consequences of system changes (e.g. increased water temperature decreases salmon populations which impact Native American food supply sources and thus tribal sovereignty rights; occupants live in a recently flooded home and are exposed to toxic black mold, sea level rise impacts on Washington tribal communities etc.).
- Practice making predictions about what may happen in the future, given a set of data.
- Research health impacts of climate change in different categories through the lens of the Washington Department of Health (e.g. ambient air quality, shellfish, water temperature, agricultural systems, changes in vector-borne diseases/host distributions, indoor air quality).
- Research how different ecosystem management practices impact human health and share the results of their investigation in a technological medium of their choice.

**Resource:**

Washington Department of Health: [Environmental Health Disparities Map](https://frontandcentered.org/ej-map/) <https://frontandcentered.org/ej-map/>

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Research health impacts of climate change in different categories through the lens of the Washington Department of Health (e.g. ambient air quality, shellfish, water temperature, agricultural systems, changes in vector-borne diseases/host distributions, indoor air quality).
- Research how different ecosystem management practices impact human health and share the results of their investigation in a technological medium of their choice.

4. Information Literacy

4.A Access and Evaluate Information

- 4.A.1 Access information efficiently (time) and effectively (sources)
- 4.A.2 Evaluate information critically and competently
- 12.D Health Literacy
  - 12.D.1 Obtaining, interpreting and understanding basic health information and services and using such information and services in ways that enhance health
  - 12.D.2 Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance and stress reduction
  - 12.D.3 Using available information to make appropriate health-related decisions
  - 12.D.5 Understanding national and international public health and safety issues
- 6. Information, Communications and Technology (ICT) Literacy
  - 6.A Apply Technology Effectively
    - 6.A.1 Use technology as a tool to research, organize, evaluate and communicate information
- 12.E Environmental Literacy
  - 12.E.1 Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water and ecosystems

**Industry Standards and/or Competencies:**

**Resource:** International Technology and Engineering Educators Association:

<https://www.iteea.org/File.aspx?id=67767&v=b26b7852>

Note: Standards are listed as stated by ITEEA and not listed numerically or alphabetically.

- 2. Students will develop an understanding of the core concepts of technology.
  - W. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.
  - 4. Students will develop an understanding of the cultural, social, economic, and political effects of technology.
  - H. Changes caused by the use of technology can range from gradual to rapid and from subtle to obvious.
  - I. Making decisions about the use of technology involves weighing the trade-offs between the positive and negative effects.
  - J. Ethical considerations are important in the development, selection, and use of technologies.
- Standard
- 5. Students will develop an understanding of the effects of technology on the environment.
  - G. Humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing, and recycling.
- Standard
- 14. Students will develop an understanding of and be able to select and use medical technologies.
  - K. Medical technologies include prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, genetic engineering, and the systems within which health is protected and maintained.
  - L. Telemedicine reflects the convergence of technological advances in a number of fields, including medicine, telecommunications, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology.
  - M. The sciences of biochemistry and molecular biology have made it possible to manipulate the genetic information found in living creatures.

**Aligned Washington State Academic Standards**

<b>Science</b>	HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	
<b>Science and Engineering Practice</b>	<b>Disciplinary Core Idea</b>	<b>Crosscutting Concept</b>
Using Mathematics and Computational Thinking	ESS3.C: Human Impacts on Earth Systems LS4.C: Adaptation LS4.D: Biodiversity and Humans ETS1.B: Developing Possible Solutions	Stability and Change Influence of Science, Engineering, and Technology on Society and the Natural World Science Is a Human Endeavor Cause and Effect

**Unit 9: Policy and Communication****Total Learning Hours for Unit: 15**

**Unit Summary:** In this unit the student is expected to understand the role of data, policy, and communication in shaping human responses to a changing climate.

- Use tools to visualize, find patterns, and/or model big data sets. Data could be related to climate, climate related impacts, or solutions to climate change (e.g. environmental, health, transportation).
- Examine the role of global, national, tribal, state, regional, county, city, school government policy in mitigating, adapting to, or amplifying impacts of climate change, and how these decisions impact different communities (e.g. environmental or climate justice),
- Explore how climate science and related issues are communicated by the media, and
- Select methods to communicate about climate science and related issues to different audiences (e.g. graphs, maps, film, social media).

**Performance Assessments:** (Districts to complete for each unit)

*Example assessments for this unit include:*

- Research the United Nations 17 Sustainability Goals and explore one through the lens of their community, designing a project that addresses one.
- Explore the role of tribal sovereignty in nation-to-nation decision-making
- Analyze a climate change related news story with a critical lens to consider data sources, claims, and evidence
- Develop and communicate a design solution to a climate change related problem at their school, district, and/or broader community. Students develop a set of messages that they would use to communicate to different audiences (e.g. peers, school board, parents, community)

**Resource:** Washington Department of Health: [Environmental Health Disparities Map](https://frontandcentered.org/ej-map/) <https://frontandcentered.org/ej-map/>

**Leadership Alignment:** (Districts to complete for each unit)

*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.*

*Example:*

- Research the United Nations 17 Sustainability Goals and explore one through the lens of their community, designing a project that addresses one.
  - Analyze a climate change related news story with a critical lens to consider data sources, claims, and evidence
  - Develop and communicate a design solution to a climate change related problem at their school, district, and/or broader community. Students develop a set of messages that they would use to communicate to different audiences (e.g. peers, school board, parents, community)
5. Media Literacy
- 5.A Analyze Media
- 5.A.2 Examine how individuals interpret messages differently, how values and points of view are included or excluded, and how media can influence beliefs and behaviors
- 5.B Create Media Products
- 5.B.1 Understand and utilize the most appropriate media creation tools, characteristics and conventions
- 5.B.2 Understand and effectively utilize the most appropriate expressions and interpretations in diverse, multi-cultural environments
12. A Global Awareness
- 12.A.1 Using 21st century skills to understand and address global issues

- 12.A.2 Learning from and working collaboratively with individuals representing diverse cultures, religions and lifestyles in a spirit of mutual respect and open dialogue in personal, work and community contexts
- 12.A.3 Understanding other nations and cultures, including the use of non-English languages
- 12.C Civic Literacy
  - 12.C.1 Participating effectively in civic life through knowing how to stay informed and understanding governmental processes
  - 12.C.2 Exercising the rights and obligations of citizenship at local, state, national and global levels
  - 12.C.3 Understanding the local and global implications of civic decisions
- 12.E Environmental Literacy
  - 12.E.2 Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.)
  - 12.E.4 Investigate and analyze environmental issues, and make accurate conclusions about effective solutions
  - 12.E.4 Take individual and collective action towards addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues)

**Industry Standards and/or Competencies:**

**Resource:** International Technology and Engineering Educators Association:

<https://www.iteea.org/File.aspx?id=67767&v=b26b7852>

Note: Standards are listed as stated by ITEEA and not listed numerically or alphabetically.

- 1. Students will develop an understanding of the characteristics and scope of technology.
  - L. Inventions and innovations are the results of specific, goal-directed research.
  - M. Most development of technologies these days is driven by the profit motive and the market.
- 2. Students will develop an understanding of the core concepts of technology.
  - W. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.
  - X. Systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.
  - Y. The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop.
  - AA. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development.
- 4. Students will develop an understanding of the cultural, social, economic, and political effects of technology.
  - H. Changes caused by the use of technology can range from gradual to rapid and from subtle to obvious.
  - I. Making decisions about the use of technology involves weighing the trade-offs between the positive and negative effects.
  - J. Ethical considerations are important in the development, selection, and use of technologies.
  - K. The transfer of a technology from one society to another can cause cultural, social, economic, and political changes affecting both societies to varying degrees.
- 5. Students will develop an understanding of the effects of technology on the environment.

- G. Humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing, and recycling.
  - J. The alignment of technological processes with natural processes maximizes performance and reduces negative impacts on the environment.
  - K. Humans devise technologies to reduce the negative consequences of other technologies.
6. Students will develop an understanding of the role of society in the development and use of technology.
- I. The decision whether to develop a technology is influenced by societal opinions and demands, in addition to corporate cultures.

**Aligned Washington State Academic Standards**

<b>Science</b>	HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	
<b>Science and Engineering Practice</b>	<b>Disciplinary Core Idea</b>	<b>Crosscutting Concept</b>
Using Mathematics and Computational Thinking Analyzing and Interpreting Data	LS4.C: Adaptation LS4.D: Biodiversity and Humans ETS1.B: Developing Possible Solutions ESS3.D: Global Climate Change	Cause and Effect Stability and Change

**Unit 10: Climate Resilience – The Final Project****Total Learning Hours for Unit: 20****Unit Summary:** In this unit, students explore the ways that communities are mitigating for and adapting to a changing climate.

- Research and document climate hazards, then develop workable solutions to lower risk.
- When developing solutions, consider the ways that a changing climate is impacting communities, and which communities are most vulnerable.
- When designing for climate resilience, employ a multi-stakeholder process that incorporates multiple perspectives (such as those of our First Nations).

**Performance Assessments:** (Districts to complete for each unit)*Example assessments for this unit include:*

- Interview a hazard mitigation (e.g. emergency response personnel) professional in their community to learn about local environmental hazards, solutions, and adaptations that increase community resilience to a changing climate
- Interview three professional members (e.g. farmer, health care worker) of their communities to learn about how those professions are using resilience principles in response to a changing climate, are adapting to a changing climate, or are working to mitigate impacts of a changing climate
- Research how their local government is or is not responding to local impacts of a changing climate to design a plan, or components of a plan, to reduce risk from climate change in their community (this could be reducing carbon emissions or adapting to a new normal) (comparing county to county, city to city)
- Design a communication tool (e.g. video, social media posts/campaigns, letter to the editor) to communicate findings to their peers
- Research technologies in agriculture or other systems that are helping these systems be more resilient to a changing climate
- Design, implement, and refine a solution to a local problem that has emerged as a result of a changing climate
- Design a tool - e.g. a computer program, commercial, documentary, etc. - that communicates their research and findings over the duration of this course.

**Leadership Alignment:** (Districts to complete for each unit)*Leadership alignment must include a unit specific project/activity that aligns with the 21<sup>st</sup> Century Leadership Skills.**Example:*

- Interview three professional members (e.g. farmer, health care worker) of their communities to learn about how those professions are using resilience principles in response to a changing climate, are adapting to a changing climate, or are working to mitigate impacts of a changing climate

12.E Environmental Literacy

12.E.2 Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.)

12.E.4 Investigate and analyze environmental issues, and make accurate conclusions about effective solutions

12.E.4 Take individual and collective action towards addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues)<sup>4</sup>*Demonstrate integrity and ethical behavior in using influence and power*

11.A.2

Leverage strengths of others to accomplish a common goal



**Industry Standards and/or Competencies:**

**Resource:** International Technology and Engineering Educators Association:

<https://www.iteea.org/File.aspx?id=67767&v=b26b7852>

Note: Standards are listed as stated by ITEEA and not listed numerically or alphabetically.

1. Students will develop an understanding of the characteristics and scope of technology.
  - L. Inventions and innovations are the results of specific, goal-directed research.
  - M. Most development of technologies these days is driven by the profit motive and the market.
2. Students will develop an understanding of the core concepts of technology.
  - W. Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.
  - X. Systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.
  - Y. The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop.
  - AA. Requirements involve the identification of the criteria and constraints of a product or system and the determination of how they affect the final design and development.
5. Students will develop an understanding of the effects of technology on the environment.
  - G. Humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing, and recycling.
  - J. The alignment of technological processes with natural processes maximizes performance and reduces negative impacts on the environment.
  - K. Humans devise technologies to reduce the negative consequences of other technologies.
6. Students will develop an understanding of the role of society in the development and use of technology.
  - I. The decision whether to develop a technology is influenced by societal opinions and demands, in addition to corporate cultures.

**Aligned Washington State Academic Standards**

<b>Science</b>	HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. impacts. HS-ESS3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
----------------	---

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Constructing Explanations and Designing Solutions Using Mathematics and Computational Thinking	LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS4.D: Biodiversity and Humans ETS1.B: Developing Possible Solutions ESS2.D: Weather and Climate ESS3.D: Global Climate Change	Stability and Change Systems and System Models