Everett Public Schools: HS Robotics

Course: STEM Robotics Engineering		**Total Framework Hours up to: 540**
CIP Code: 150405	☐ **Exploratory** ☒ **Preparatory**	**Date Last Modified: 7/28/2014**
Career Cluster: Manufacturing		**Cluster Pathway: Manufacturing Production Process Development**

Course Resources

This HS Robotics Framework is aligned with the curriculum and resources from Carnegie Mellon University's Robotics Academy®, Tufts University, LEGO®, Pitsco®, and Intel Corp.

The curricular content and teacher collaboration resources are being hosted by Portland State University's Ensemble STEM Robotics site.

This is a STEM course which teaches Science, Technology, Engineering and Math concepts through the hardware and software of the LEGO® MINDSTORMS® NXT as well as the Tetrix® hardware and RobotC software platforms.

Leadership opportunities are present throughout the course and are aligned with *Technology Student Association* (TSA), *FIRST*® Tech Challenge (FTC) competition and For Inspiration and Recognition of Science and Technology

Units 1 - 13: NXT & NXT-G

Many of the introductory NXT-G programming lessons are built around the *NXT Video Trainer 2.0* product from the Carnegie Mellon Robotics Academy® which is available for free online or for purchase on DVD.

Units 1 through 13 in this framework are aligned with the Scope and Sequence of STEM Robotics 101 master curriculum.

These units are broken down into lessons, with each lesson containing an Overview, Objectives, Instructor's Guide, Primary Instructional Material and Formative/Summative Assessments.

Lessons may also include Differentiated Instructional material and Additional Assessments. The structure, conventions and layout of HS Robotics 101 portion of this curriculum are summarized on this page.

Units 14-22: RobotC

Units 14 through 22 utilize the *RobotC Curriculum for Tetrix® and LEGO® Mindstorms®* from the Carnegie Mellon Robotics Academy® which is available for free online or for purchase on DVD.

Programming lesson encompass both the Robot Virtual World® application as well as the physical Terix® platform.

Units 23-30: Tetrix®

Unit 23 uses the PTC® software provided to FTC teams by *FIRST*® for Computer Aided Design (CAD).

Units 24 through 30 utilize Getting Started Guide for the Tetrix® curriculum.

Units 31 & 32: Project Management

Units 31 and 32 adapt the resources from PMforCTE to the *FIRST*® FTC competition.

Unit 1: Safety and STEM Career Awareness (covered as appropriate throughout course)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will demonstrate knowledge and skills of Robotics lab safety.
Student will present a plan to pursue a self-selected STEM career pathway

Leadership Alignment:

2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
1.A.1 Use a wide range of idea creation techniques (such as brainstorming
1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)

Produce Results

10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results

Standards and Competencies

Standard/Unit:
Describe health and safety procedures in a NXT Robotics lab.
Identify STEM careers and pathways.

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

- Identify health and safety risks in a NXT Robotics lab
- Explain health and safety procedures which address risks in a NXT Robotics lab
- Identify health and safety risks in a Tetrix Robotics lab
- Explain health and safety procedures which address risks in a Tetrix Robotics lab
- Describe the breadth of possible STEM careers
- Identify and explore a STEM career related to an area of student interest
- Explain the education pathway to a given STEM career

Aligned Common Core & Washington State Standards

Art	4.5.1: Applies and analyzes how arts knowledge, skills, and work habits are needed and used in the world of work.
Communications	9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating

	the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
Educational Technology	1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. S-MD 5: (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
Reading	9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Science	9-12 SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12 SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12 SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12 APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12 APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12 APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12 APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12 APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11 PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while

	like charges repel. 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11 PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

Unit 2: Introduction to Robotics

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Student will create a research report on real and fictional robots. Student will demonstrate key attributes of NXT components. Student will assemble NXT golfing machine.	
Leadership Alignment: 3.A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts 3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member	
Standards and Competencies	
Standard/Unit: Describe characteristics of robots and explain/use NXT components	
Competencies	**Total Learning Hours for Unit: 15**
• Identify characteristics of a robot • Create a research report on important/iconic robotics, both real and fictional • Describe how the functions and characteristics of a robot can been seen in the NXT system • Explain the sense and response systems of the NXT system • Document/describe key attributes of the NXT electronic, mechanical and structural components • Explain the function of a two-gear gear train through the bicycle analogy • Construct an NXT Golfing Machine based on Faraday's Principle	
Aligned Common Core & Washington State Standards	
Art	4.5.1: Applies and analyzes how arts knowledge, skills, and work habits are needed and used in the world of work.
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
Educational Technology	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

	N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel. 9-11PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another

	form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	4.1.1: Analyzes a major historical event and how it is represented on timelines from different cultural perspectives.
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 3: Circuits and Computers

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Student will build NXT circuits and run test programs on the NXT computer	
Leadership Alignment: 3.A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts 3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member 9.B.3 Leverage social and cultural differences to create new ideas and increase both innovation and quality of work	
Standards and Competencies	
Standard/Unit: Build Robotic circuits and run robotics programs	
Competencies	**Total Learning Hours for Unit: 10**
• Explain the four parts of a circuit and give examples of each • Differentiate between insulators, conductors and semiconductors • Describe how the NXT acts as a circuit • List examples of insulators, conductors and semiconductors within the NXT system • Explain the advantage of each of the NXT power source options • Build five NXT test circuits to demonstrate the capabilities of the various sensors • Explain the four reasons tube based computers stagnated and how the transistor solved these issues • Define and explain Moore's Law • Describe the four parts of a computer • Distinguish between the different type of storage in a computer • Describe how the NXT acts a as a computer and the role of its different types of memory chips • Run five NXT test programs and identify the parts of the NXT computer used by each	
Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
Educational Technology	1.2.1: Communicate and collaborate to learn with others. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

	N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel. 9-11PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.

	9-11PS2A: Atoms are composed of protons, neutrons, and electrons. The nucleus of an atom takes up very little of the atom's volume but makes up almost all of the mass. The nucleus contains protons and neutrons, which are much more massive than the electrons surrounding the nucleus. Protons have a positive charge, electrons are negative in charge, and neutrons have no net charge. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	4.1.1: Analyzes a major historical event and how it is represented on timelines from different cultural perspectives.
Writing	9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 4: Hardware, Software, Firmware

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Students will build a robot and write simple programs to control it using firmware	
Leadership Alignment: 1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts) 1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts 3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams 3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal 3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member	
Standards and Competencies	
Standard/Unit: Understand the roles of hardware, software and firmware, and how they interact in the NXT	
Competencies	**Total Learning Hours for Unit: 10**
• Describe the role of each of the three parts of a microprocessor's hardware • Describe the nature and role of software in a microprocessor • Explain how a microprocessor's hardware and software work together • Update the NXT firmware and use it to explore the NXT systems and run test programs • Use the NXT firmware to explore the NXT systems and run test programs • Use the NXT hardware to build a robot from pictorial instructions • Write 5-step on-board programs for the NXT using firmware capability	
Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
Educational Technology	1.2.1: Communicate and collaborate to learn with others. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling.

	N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel. 9-11PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Unit 5: Straight Ahead (programming precision forward and reverse motion)

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Student will manipulate the straight movement of a robot through programming parameters	
Leadership Alignment: 2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation 2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs 2.C.2 Analyze and evaluate major alternative points of view 2.C.3 Synthesize and make connections between information and arguments 2.C.4 Interpret information and draw conclusions based on the best analysis 2.C.5 Reflect critically on learning experiences and processes 1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts) 1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts 3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams 3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal 3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member	
Standards and Competencies	
Standard/Unit: Program a robot for precise forward and reverse motion. Determine and use the relationship between power level and travel time/speed	
Competencies	**Total Learning Hours for Unit: 15**
• Manipulate the Video Trainer software • Download a program from NXT-G to a robot • Calculate program parameters based on the circumference of a circle • Program a robot for precision forward and reverse motion • Measure, plot and interpolate travel time vs power level data • Calculate, plot and interpolate speed vs power level data	
Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

	11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical

	tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQA: Scientists generate and evaluate questions to investigate the natural world. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia).
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

	9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 6: Sights, Sounds and Gears (using light sensors, sound sensors, and gearing)

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Student will program a robot to respond to light and sound sensors. Student will calculate gears ratios and design a robot to trade off speed vs torque	
Leadership Alignment: 2.C.3 Synthesize and make connections between information and arguments 2.C.4 Interpret information and draw conclusions based on the best analysis 2.C.5 Reflect critically on learning experiences and processe 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 3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade) 1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts 2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways 2.D.2 Identify and ask significant questions that clarify various points of view 3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams 3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal 3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member 9.A.1 Know when it is appropriate to listen and when to speak 9.A.2 Conduct themselves in a respectable, professional manner 9.B.2 Respond open-mindedly to different ideas and values 9.B.3 Leverage social and cultural differences to create new ideas and increase both innovation and quality of work	
Standards and Competencies	
Standard/Unit: Build robots to responds to light and sound. Calculate and use gear ratios to optimize robot performance	
Competencies	**Total Learning Hours for Unit: 15**

- Explain each parameter of the light sensor configuration panel
- Calculate a light sensor threshold
- Program a robot to respond to the light sensor
- Explain each parameter of the sound block (audible output) configuration panel
- Program a robot to respond to give an audible response
- Explain each parameter of the sound sensor configuration panel
- Calculate a sound sensor threshold
- Program a robot to respond to the sound sensor
- Explain the timing sensitivity of the sound sensor
- Explain gearing up and down in relation to speed and torque
- Calculate gear ratios
- Describe the difference between Science and Engineering
- Build a robot using the Engineering Process which incorporates precision forward motion, gear ratios, light and sound sensors

Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

	N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as

	clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQA: Scientists generate and evaluate questions to investigate the natural world. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 7: Taking Turns (programming precision turns and manipulators)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will design and build a robot to maneuver through turns, control an appendage, and design a program from a flow chart

Leadership Alignment:

2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best analysis
2.C.5 Reflect critically on learning experiences and processe

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
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)

1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.A.1 Know when it is appropriate to listen and when to speak
9.A.2 Conduct themselves in a respectable, professional manner
9.B.2 Respond open-mindedly to different ideas and values
9.B.3 Leverage social and cultural differences to create new ideas and increase both innovation and quality of work

Standards and Competencies

Standard/Unit:
Build robots capable of precision maneuvers, including movable appendages.
Plan and develop linear programs.

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

- Explain how each parameter of the Move Block can be configured to control a robot's turning response
- Write a program for a robot to maneuver with turns
- Write a program for a robot to maneuver with various precision turns
- Write a program for a robot to combine turning and sensor response
- Create a flowchart to represent a multi-step activity
- Develop a robot program from a flow chart
- Explain each parameter of the Motor Block
- Write a program using the Motor Block to control a third motor in a robot
- Design, build and program a robot to write block characters on a horizontal dry-erase board

Aligned Common Core & Washington State Standards	
Art	2.3.1: Applies a responding process to a presentation/exhibit of visual art
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. F-BF1: Write a function that describes a relationship between two quantities.

	G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in

	sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 8: See, Touch, Repeat (using ultrasonic sensor, touch sensor and programming with loops)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will design and build a robot to use all four sensors and create programs with repeating behaviors

Leadership Alignment:

2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best analysis
2.C.5 Reflect critically on learning experiences and processe

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
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)

1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.A.1 Know when it is appropriate to listen and when to speak
9.A.2 Conduct themselves in a respectable, professional manner
9.B.2 Respond open-mindedly to different ideas and values
9.B.3 Leverage social and cultural differences to create new ideas and increase both innovation and quality of work

Standards and Competencies

Standard/Unit:
Build robots that respond to touch and their proximity to objects.
Plan and develop programs with repeating behaviors (loops)

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

• Describe how computers use digital information to represent numbers, words and images • Explain why computers only use digital information • Explain each parameter of the touch sensor configuration panel • Program a robot to respond to the touch sensor • Explain each parameter of the ultrasonic sensor configuration panel • Program a robot to respond to the ultrasonic sensor • Explain each parameter of the loop configuration panel • Program a robot for repeating behavior controlled by timers, counters and sensors • Design, build and program an animatronic robot which resembles and behaves like a selected animal	
Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context.

	A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a

	process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 9: Decisions, Decisions (using switch blocks and advanced flow charts)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will design and build a robot that makes decisions based on sensory input

Leadership Alignment:

2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best analysis
2.C.5 Reflect critically on learning experiences and processe

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
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)

1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.A.1 Know when it is appropriate to listen and when to speak
9.A.2 Conduct themselves in a respectable, professional manner
9.B.2 Respond open-mindedly to different ideas and values
9.B.3 Leverage social and cultural differences to create new ideas and increase both innovation and quality of work

Standards and Competencies

Standard/Unit:
Build robots that make binary decisions based on sensory input.
Plan and develop branching programs with switch blocks nested inside loops.

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

- Explain each parameter of the switch block configuration panel
- Program a robot to make decisions based on sensory input
- Explain how a fast switch block nested inside a loop improves detection behavior
- Build and program a robot to continuously detect objects
- Build and program a robot to follow a line
- Create a flow chart to design a hierarchical program
- Design, build and program a sumobot robot which pushes an opponent out of an arena

Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes

	with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID9: Distinguish between correlation and causation. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently

	and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 10: Get a Grip (using gripper arms and my blocks)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will design and build a robot that manipulates objects with a gripper attachment.

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming)
1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Build robots that can grip and manipulate objects.
Plan and develop hierarchical programs.

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

- Describe how computers chip are designed and manufactured
- Explain why computers chips are manufactured in "clean rooms"
- Build a robot with a gripper attachment
- Program a robot to coordinate object manipulation with sensor input
- Design a hierarchical program using my blocks
- Design, build and program a robot capable of sorting objects by color

Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

	G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID9: Distinguish between correlation and causation. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently..
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional

	discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 11: Working with Data (using data hubs and wires)

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Student will design and build a robot that use parameters passed from one block of their program to another.	
Leadership Alignment: 2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs 2.C.2 Analyze and evaluate major alternative points of view 2.C.3 Synthesize and make connections between information and arguments 2.C.4 Interpret information and draw conclusions based on the best an 10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to: 10.B.1.a Work positively and ethically 10.B.1.b Manage time and projects effectively 10.B.1.c Multi-task 10.B.1.d Participate actively, as well as be reliable and punctual 10.B.1.e Present oneself professionally and with proper etiquette 10.B.1.f Collaborate and cooperate effectively with teams 10.B.1.g Respect and appreciate team diversity 10.B.1.h Be accountable for results 3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams 3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal 3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member 9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds 9.B.2 Respond open-mindedly to different ideas and values	
Standards and Competencies	
Standard/Unit: Build and program robots that override block data with parameters passed from another block. Plan and develop hierarchical programs which pass parameters between the levels of hierarchy.	
Competencies	**Total Learning Hours for Unit: 15**
• Describe the purpose of a Data Hub in NXT-G • Explain the parameters on the Move Block Data Hub • Program a robot to move with a parameter driven from a Data Hub • Explain the different Data Types in NXT-G • Program a robot to display number-type data using Data Hubs and Conversion Blocks • Design a hierarchical program which passes parameters using data wires with advanced my blocks • Design, build and program a robot capable of line following under remote control	
Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating

	the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID9: Distinguish between correlation and causation. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical

	meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.RI6-7: Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. 11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia)

	9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 12: Variables and Logic (using variables, math blocks and Boolean logic)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will design, build and program a robot that uses variable parameters, algebraic calculations and Boolean logic.

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values
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
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
3.A.4 Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
3.A.5 Communicate effectively in diverse environments (including multi-lingual

Standards and Competencies

Standard/Unit:
Build and program robots that override block data with parameters passed from a Variable Block.
Build and program robots that use algebraic combinations of multiple variables through Math Blocks.
Build and program robots that use Boolean logic to control program flow.

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

- Describe the purpose of a Variable Block in NXT-G
- Explain the parameters on the Variable Block
- Program a robot to write and read variables
- Program a robot to display variables on the NXT screen
- Describe the purpose of a Math Block in NXT-G
- Explain the parameters on the Math Block
- Program a robot to respond to algebraic combinations of variables using Math Blocks
- Describe the Boolean logic data type and operators in NXT-G
- Explain the Boolean logic data plugs in various NXT-G blocks
- Program a robot to respond to a logic-controlled Loop Block

Aligned Common Core & Washington State Standards

Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	

Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.RI6-7: Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as

	well as in words in order to address a question or solve a problem. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. 11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same

	speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 13: Data Logging with Sensors (using sensors for scientific experimentation)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will design experiments and program the NXT to perform scientific data logging of sensor readings

Leadership Alignment:

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values
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
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
3.A.4 Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
3.A.5 Communicate effectively in diverse environments (including multi-lingual

Standards and Competencies

Standard/Unit:
Program the NXT to perform real time data logging with NXT sensors.
Program the NXT to perform remote logging with NXT sensors.
Program the NXT to perform data logging with advanced sensors.
Analyze logged data with NXT-G analysis tools and spreadsheets.
Design, build and program a robot to perform active data logging.

Competencies	**Total Learning Hours for Unit: 30**

- Describe the role of data logging in the Scientific Method
- Program the NXT to perform real time data logging with NXT sensors.
- Program the NXT to perform remote logging with NXT sensors.
- Program the NXT to perform data logging with advanced sensors (real time and remote)
- Analyze logged data with NXT-G analysis tools
- Upload logged data to a spreadsheet for advanced analysis
- Program an embedded Data Logger into a NXT-G program
- Design, build and program a robot to perform active data logging with NXT-G

Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.

Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*). F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-IF7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text.RI6-7: Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

	9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. 11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQA: Scientists generate and evaluate questions to investigate the natural world. 9-12INQB: Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. **9-12 INQD Communicate Clearly** The methods and procedures that scientists use to obtain *evidence* must be clearly reported to enhance opportunities for further *investigation*. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality

	means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1D A net force will cause an object to accelerate or change direction. A less massive object will speed up more quickly than a more massive object subjected to the same force. (Newton's Second Law of Motion, F=ma) 9-11 PS1E Whenever one object exerts a force on another object, a force of equal magnitude is exerted on the first object in the opposite direction. (Newton's Third Law of Motion) 9-11 PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel. 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS2A: Atoms are composed of protons, neutrons, and electrons. The nucleus of an atom takes up very little of the atom's volume but makes up almost all of the mass. The nucleus contains protons and neutrons, which are much more massive than the electrons surrounding the nucleus. Protons have a positive charge, electrons are negative in charge, and neutrons have no net charge. 9-11 PS2G: Chemical reactions change the arrangement of atoms in the molecules of substances. Chemical reactions release or acquire energy from their surroundings and result in the formation of new substances. 9-11 PS2H: Solutions are mixtures in which particles of one substance are evenly distributed through another substance. Liquids are limited in the amount of dissolved solid or gas that they can contain. Aqueous solutions can be described by relative quantities of the dissolved substances and acidity or alkalinity (pH). 9-11 PS2I: The rate of a physical or chemical change may be affected by factors such as temperature, surface area, and pressure. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11 PS3B: Kinetic energy is the energy of motion. The kinetic energy of an object is defined by the equation: Ek = 1/2 mv2 9-11 PS3C: Gravitational potential energy is due to the separation of mutually attracting masses. Transformations can occur between gravitational potential energy and kinetic energy, but the total amount of energy remains constant. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio. 9-11 ES2B: Climate is determined by energy transfer from the sun at and near Earth's surface. This energy transfer is influenced by dynamic processes such as cloud cover and Earth's rotation, as well as static conditions such as proximity to mountain ranges and the ocean. Human activities, such as burning of fossil fuels, also affect the global climate. 9-11 LS1A: Carbon-containing compounds are the building blocks of life. Photosynthesis is the process that plant cells use to combine the energy of sunlight with molecules of carbon dioxide and water to produce energy-rich compounds that contain carbon (food) and release oxygen.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

	9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 14: Advanced NXT Sensors (Bluetooth and third party sensors)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will design, build and program a robot that uses advanced (third party) sensors and Bluetooth communications.

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values
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
3.A.3 Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
3.A.4 Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
3.A.5 Communicate effectively in diverse environments (including multi-lingual

Standards and Competencies

Standard/Unit: Build and program robots that use Bluetooth communication Build and program robots that use advanced third party sensors	
Competencies	**Total Learning Hours for Unit: 15**
• Explain each parameter of the Bluetooth, Send Message and Receive Message blocks' configuration panel • Program a robot to send and receive Bluetooth messages • Design, build and program a robots that communicate to compete a group task • Design, build and program a multi-NXT brick robot • Import and install NXT blocks for third party sensors • Explain each parameter of the third party block configuration panel • Design, build and program a robot using third party sensors	
Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

	A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical

	tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. 11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces.

	9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

Unit 15: RobotC Virtual World (programming a virtual robot)

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Student will write programs for virtual robot operating in a virtual environment.	
Leadership Alignment: 2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs 2.C.2 Analyze and evaluate major alternative points of view 2.C.3 Synthesize and make connections between information and arguments 2.C.4 Interpret information and draw conclusions based on the best an 1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts) 1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts 9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds 9.B.2 Respond open-mindedly to different ideas and values	
Standards and Competencies	
Standard/Unit: Create programs in the RobotC for the Robot Virtual World	
Competencies	**Total Learning Hours for Unit: 20**
• Demonstrate proficient use of RobotC Virtual World environment • Write, test and debug programs for virtual robot movement • Write, test and debug programs for virtual robot sensor operations • Write, test and debug programs for virtual robot servo operations • Write, test and debug programs for virtual robot using variables and functions	
Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Educational Technology	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. 1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID9: Distinguish between correlation and causation. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

	11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds.

Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

Unit 16: Introduction to RobotC Programming (basic & precision movement)

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Student will program Tetrix robots to move using both dead reckoning and odometry	
Leadership Alignment: 2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs 2.C.2 Analyze and evaluate major alternative points of view 2.C.3 Synthesize and make connections between information and arguments 2.C.4 Interpret information and draw conclusions based on the best an 1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts) 1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts 9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds 9.B.2 Respond open-mindedly to different ideas and values	
Standards and Competencies	
Standard/Unit: Create RobotC programs for dead reckoning movement of Tetrix robots (time and power based movement) Create RobotC programs for odometery movement of Tetrix robots (encoder based movement)	
Competencies	**Total Learning Hours for Unit: 15**
• Demonstrate proficient use of RobotC for Tetrix programming environment • Configure RobotC for Tetrix DC motor operations • Write, test and debug programs for Tetrix robot straight movement with dead reckoning • Write, test and debug programs for Tetrix robot turning movement with dead reckoning • Write, test and debug programs for Tetrix robot complex movement with dead reckoning • Write, test and debug programs for Tetrix robot straight movement with odometry • Write, test and debug programs for Tetrix robot turning movement with odemetry • Write, test and debug programs for Tetrix robot complex movement with odometry	
Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

	9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

	11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic

	forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 17: RobotC Manipulators (using servos)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will program Tetrix robots to use servo motors

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Create RobotC programs for single servo operations on Tetrix robots
Create RobotC programs for multi-servo operations on Tetrix robots
Create RobotC programs for complex servo and movements operations on Tetrix robots

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

- Configure RobotC for Tetrix servo motor operations
- Write, test and debug programs for Tetrix robot precision servo control
- Write, test and debug programs for Tetrix robot precision multi-servo control
- Write, test and debug programs for Tetrix robot coordinated movement and manipulator control
- Write, test and debug programs for Tetrix robot coordinated movement and complex apparatus control

Aligned Common Core & Washington State Standards

Art	

Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE5: Interpret the parameters in a linear or exponential function in terms of a context.

	G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge.

	9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

Unit 18: RobotC Sensors (using basic NXT sensors)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will program Tetrix robots to use the four basic NXT sensors

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Create RobotC programs using the touch, light, ultrasonic and sound sensors on Tetrix robots
Create RobotC programs for Tetrix robots using while, if/else, switch case and timer control constructs

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

- Write, test and debug programs for Tetrix robots using the touch sensor
- Write, test and debug programs for Tetrix robots using the While loop
- Write, test and debug programs for Tetrix robots using the ultrasonic sensor
- Write, test and debug programs for Tetrix robots using the light sensor
- Write, test and debug programs for Tetrix robots using the If/Else
- Write, test and debug programs for Tetrix robots using the Switch-Case
- Write, test and debug programs for Tetrix robots using Timers
- Write, test and debug line following programs for Tetrix robots

- Write, test and debug programs for Tetrix robots using the sound sensor

Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions.

	F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.

	9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 19: RobotC Functions (using variables, functions and debugging)

COMPONENTS AND ASSESSMENTS
Performance Assessments: Student will program Tetrix robots using variables and functions
Leadership Alignment: 2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs 2.C.2 Analyze and evaluate major alternative points of view 2.C.3 Synthesize and make connections between information and arguments 2.C.4 Interpret information and draw conclusions based on the best an 1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts) 1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts 2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways 2.D.2 Identify and ask significant questions that clarify various points of view 2.C.5 Reflect critically on learning experiences and processes 10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to: 10.B.1.a Work positively and ethically 10.B.1.b Manage time and projects effectively 10.B.1.c Multi-task 10.B.1.d Participate actively, as well as be reliable and punctual 10.B.1.e Present oneself professionally and with proper etiquette 10.B.1.f Collaborate and cooperate effectively with teams 10.B.1.g Respect and appreciate team diversity 10.B.1.h Be accountable for results 3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams 3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal 3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member 9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds 9.B.2 Respond open-mindedly to different ideas and values
Standards and Competencies
Standard/Unit: Create RobotC programs for Tetrix robots using variables to improve flexibility and efficiency Create RobotC programs for Tetrix robots using functions to improve flexibility and efficiency
Competencies — **Total Learning Hours for Unit: 15**
• Demonstrate proficiency with variables and data types in RobotC • Write, test and debug programs for Tetrix robots using variables and different data types • Write, test and debug programs for Tetrix robots using variables for While loop. If/Else and Switch-Case control constructs • Write, test and debug programs for Tetrix robots using functions • Write, test and debug programs for Tetrix robots using variables within functions
Aligned Common Core & Washington State Standards

Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse

	partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

	F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

	11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

	11-12WHST6: 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.

Unit 20: RobotC Teleop (Remote Control)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will program Tetrix robots for Bluetooth wireless remote control

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Create RobotC programs for Tetrix robot remote control movement through joystick commands
Create RobotC programs for Tetrix robot remote control manipulators through joystick button commands

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

- Demonstrate proficiency with establishing Bluetooth communication between PC and Tetrix robot
- Write, test and debug programs for Tetrix robot remote control of basic movement through joystick commands
- Write, test and debug programs for Tetrix robot remote control of optimized movement through joystick commands
- Write, test and debug programs for Tetrix robot remote control of manipulators and mechanical apparatus through joystick and button commands
- Write, test and debug programs for Tetrix robots combining remote control and sensor-based autonomous actions

Aligned Common Core & Washington State Standards

Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse

	partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities.

	F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a

	process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

Unit 21: RobotC Advanced Sensors (third party sensors)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will program Tetrix robots using advanced third party sensors

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Create RobotC programs for Tetrix robots using an advanced third party sensors
Create RobotC programs for Tetrix robots using a sensor multiplexor and multiple sensors

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

- Demonstrate proficiency with installing third party sensor software
- Write, test and debug programs for Tetrix robots using a third party sensor
- Write, test and debug programs for Tetrix robots using a third party sensor multiplexor
- Write, test and debug programs for Tetrix robots using multiple sensors (LEGO and third party) and a third party sensor multiplexor

Aligned Common Core & Washington State Standards

Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively.

	11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities.

	F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

	9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

	9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 22: RobotC Multi-Robot Communication (using swarm robotics)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will program Tetrix robots for multi-robot communication

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Create RobotC programs for Tetrix robots using Bluetooth communication between robots
Create RobotC programs for Tetrix robots using WiFi communication between robots

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

- Demonstrate proficiency with establishing Bluetooth communication between a PC and a Tetrix robot
- Demonstrate proficiency with establishing Bluetooth communication between two or more Tetrix robots
- Write, test and debug programs for coordinated task accomplishment with Tetrix robots using Bluetooth communication
- Demonstrate proficiency with establishing WiFi communication between a PC and a Tetrix robot
- Demonstrate proficiency with establishing WiFi communication between two or more Tetrix robots
- Write, test and debug programs for coordinated task accomplishment with Tetrix robots using WiFi communication

Aligned Common Core & Washington State Standards

Art	

Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval.

	Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-GPE7: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”). S-CP2: Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific

	scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.

Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 23: Software Design for Competition (FIRST® Tech Challenge)

COMPONENTS AND ASSESSMENTS

Performance Assessments:

Student will program Tetrix robots for competition in the *FIRST*® Tech Challenge

Leadership Alignment:

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:

Create autonomous RobotC programs for Tetrix robots competing in the FIRST® Tech Challenge
Create teleop RobotC programs for Tetrix robots competing in the FIRST® Tech Challenge

Competencies	**Total Learning Hours for Unit: 30**

- Demonstrate proficiency with the setup and use of the FTC Samantha module
- Demonstrate proficiency with the setup and use of the FTC Field Control System
- Demonstrate proficiency with use of the FTC competition software templates
- Demonstrate proficiency with use of the FTC competition software checklist
- Write, test and debug programs for multiple FTC autonomous mode scenarios
- Write, test and debug programs for FTC teleop mode operations
- Demonstrate proficiency with software management techniques, including revision, backup, quality and reliability controls

Aligned Common Core & Washington State Standards

Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

	F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-GPE7: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”). S-CP2: Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

	9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. 11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction.

	9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel. 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 24: CAD for Tetrix (Computer Aided Design of Tetrix Robots)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will design Tetrix robots in a 3-D CAD environment

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Design 3-D models of Tetrix robots with CAD tools
Manipulate and animate Tetrix robots in a 3-D CAD environment

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

- Demonstrate proficient use of 3-D CAD environment
- Design and manipulate Tetrix structural sub-assemblies with CAD
- Design, manipulate and animate Tetrix active mechanical sub-systems with CAD
- Design, manipulate and animate complete Tetrix robots with CAD

Aligned Common Core & Washington State Standards

Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively.

	11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.3: 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 2.2.1: Develop skills to use technology effectively. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED 2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-CO2: Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). G-CO3: Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. G-CO5: Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. G-CO12: Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices,

	paper folding, dynamic geometric software, etc.). G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-GPE7: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI 7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.

	9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. . 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

Unit 25: Introduction to Tetrix Hardware

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Student will identify Tetrix components and best practices	
Leadership Alignment: 1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts) 1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts 2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways 2.D.2 Identify and ask significant questions that clarify various points of view 10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to: 10.B.1.a Work positively and ethically 10.B.1.b Manage time and projects effectively 10.B.1.c Multi-task 10.B.1.d Participate actively, as well as be reliable and punctual 10.B.1.e Present oneself professionally and with proper etiquette 10.B.1.f Collaborate and cooperate effectively with teams 10.B.1.g Respect and appreciate team diversity 10.B.1.h Be accountable for results	
Standards and Competencies	
Standard/Unit: Identify Tetrix hardware components and their uses Demonstrate knowledge of Tetrix safety and best building practices	
Competencies	**Total Learning Hours for Unit: 10**
• Identify Tetrix structure components and their uses • Identify Tetrix mechanical components and their uses • Identify Tetrix electronic components and their uses • Demonstrate proficiency with Tetrix safety guidelines • Demonstrate proficiency with Tetrix best building practices	
Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance

	understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality

	means less of another. All solutions involve consequences, some intended, others not.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

Unit 26: Tetrix First Build (2WD platform with sensors)

COMPONENTS AND ASSESSMENTS	
Performance Assessments: Student will build a basic Tetrix robot	
Leadership Alignment: 9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds 9.B.2 Respond open-mindedly to different ideas and values 1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts) 1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts 2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways 2.D.2 Identify and ask significant questions that clarify various points of view	
Standards and Competencies	
Standard/Unit: Construct a two wheel drive Tetrix robot with all four basic sensors	
Competencies	**Total Learning Hours for Unit: 15**
• Build and test a Tetrix robot chassis • Demonstrate proficiency with DC motor installation and wiring, including encoders • Build and test a Tetrix robot with a 2WD drivetrain • Build and test a Tetrix robot with sound, light, ultrasonic and touch sensors • Test front-wheel-drive, rear-wheel-drive, and various idler wheel combinations	
Aligned Common Core & Washington State Standards	
Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: Locate and organize information from a variety of sources and media. 2.2.1: Develop skills to use technology effectively.

	2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently

	and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

Unit 27: Tetrix Manipulators (attachments using servo motors)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will build Tetrix robots with active attachments

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Build Tetrix robots with active attachments utilizing both Tetrix servo and NXT motors

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

- Demonstrate proficiency with servo motor installation and wiring
- Build and test an arm and gripper attachment
- Build and test a harvester and transporter attachment
- Build and test a dispenser attachment
- Build and test a launcher attachment
- Design, build and test a custom attachment

Aligned Common Core & Washington State Standards

Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse

	partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

	G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.

	9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

Unit 28: Tetrix Advanced Hardware (treads and chain/sprocket)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will build Tetrix robots with advanced hardware

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Build Tetrix robots with chain and sprocket assemblies
Build Tetrix robots with tank-tread assemblies

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

- Demonstrate proficiency with chain and sprocket assemblies
- Build and test a Tetrix robot with chain and sprocket propulsion
- Build and test a Tetrix robot with a chain and sprocket manipulator
- Build and test a Tetrix robot with beveled gear assemblies
- Demonstrate proficiency with tank-tread assemblies
- Build and test a Tetrix robot with tank-tread propulsion
- Build and test a Tetrix robot with a tank tread manipulator

Aligned Common Core & Washington State Standards

Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

	F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.

	9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 29: Tetrix Custom Hardware (plexiglass & aluminum fabrication)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will build Tetrix robots with FTC-legal fabricated materials

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Build Tetrix robots with fabricated plexiglass assemblies
Build Tetrix robots with fabricated aluminum assemblies

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

- Demonstrate proficiency and safety with plexiglass cutting, drilling and molding equipment
- Build and test a Tetrix robot with a fabricated plexiglass assembly
- Demonstrate proficiency and safety with aluminum cutting, drilling and manipulating equipment
- Build and test a Tetrix robot with a fabricated sheet aluminum assembly
- Build and test a Tetrix robot with a fabricated tube aluminum assembly

Aligned Common Core & Washington State Standards

Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse

	partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-BF1: Write a function that describes a relationship between two quantities. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical

	meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. as in words in order to address a question or solve a problem. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.

	9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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.

Unit 30: Tetrix Advanced Sensors (third party and custom sensors)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will build Tetrix robots with third party and custom sensors

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Build Tetrix robots incorporating third party sensors

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

- Demonstrate proficiency with sensor multiplexor and third party sensor installation
- Build and test a Tetrix robot incorporating sensor multiplexors and third party sensors
- Demonstrate proficiency with custom sensor design and installation
- Build and test a Tetrix robot incorporating a custom sensor design

Aligned Common Core & Washington State Standards

Art	
Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse

	partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL 4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL 4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: Locate and organize information from a variety of sources and media. 1.3.4: Use multiple processes and diverse perspectives to explore alternative solutions 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a

	relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST6: Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. 11-12RST6: Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

	11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia). 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

	9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 31: Hardware Design for Competition (FIRST® Tech Challenge)

COMPONENTS AND ASSESSMENTS

Performance Assessments:

Student will build Tetrix robots for competition in the *FIRST*® Tech Challenge

Leadership Alignment:

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:

Build Tetrix robot for autonomous and teleop operations in the *FIRST*® Tech Challenge

Competencies	**Total Learning Hours for Unit: 30**

- Demonstrate proficiency with the setup and use of the FTC Samantha module
- Demonstrate proficiency with the setup and use of the FTC Field Control System
- Demonstrate proficiency with use of the FTC competition hardware checklist
- Design, build and test Tetrix robot for FTC autonomous mode scenarios
- Design, build and test Tetrix robot for FTC teleop mode operations
- Demonstrate proficiency with competitive hardware management techniques, including risk management, redundancy, fault tolerance, quality/reliability controls

Aligned Common Core & Washington State Standards

Art	

Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F-IF1: Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F-IF4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval.

	Estimate the rate of change from a graph. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE2: Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). F-LE3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. F-LE4: For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. G-CO1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. G-SRT8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-GPE7: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. G-MG1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). G-MG2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G-MG3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S-ID7: Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. S-ID8: Compute (using technology) and interpret the correlation coefficient of a linear fit. S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”). S-CP2: Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person’s life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific

	scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. 11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQA: Scientists generate and evaluate questions to investigate the natural world. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. 9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society. 9-11PS1A: Average velocity is defined as a change in position with respect to time. Velocity includes both speed and direction. 9-11PS1B: Average acceleration is defined as a change in velocity with respect to time. Acceleration indicates a change in speed and/or a change in direction.

	9-11PS1C: An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force. (Newton's First Law of Motion, the Law of Inertia) 9-11 PS1G: Electrical force is a force of nature independent of gravity that exists between charged objects. Opposite charges attract while like charges repel. 9-11 PS1H: Electricity and magnetism are two aspects of a single electromagnetic force. Moving electric charges produce magnetic forces, and moving magnets produce electric forces. 9-11PS2A: Atoms are composed of protons, neutrons, and electrons. The nucleus of an atom takes up very little of the atom's volume but makes up almost all of the mass. The nucleus contains protons and neutrons, which are much more massive than the electrons surrounding the nucleus. Protons have a positive charge, electrons are negative in charge, and neutrons have no net charge. 9-11PS3A: Although energy can be transferred from one object to another and can be transformed from one form of energy to another form, the total energy in a closed system remains the same. The concept of conservation of energy, applies to all physical and chemical changes. 9-11PS3D: Waves (including sound, seismic, light, and water waves) transfer energy when they interact with matter. Waves can have different wavelengths, frequencies, and amplitudes, and travel at different speeds. 9-11 PS3E: Electromagnetic waves differ from physical waves because they do not require a medium and they all travel at the same speed in a vacuum. This is the maximum speed that any object or wave can travel. Forms of electromagnetic waves include X-rays, ultraviolet, visible light, infrared, and radio.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 32: Introduction to Project Management

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will develop and execute a mock project plan

Leadership Alignment:
2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Initiate and develop a detailed project plan
Execute and monitor a detailed project plan

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

- Demonstrate proficiency with conventions and tools for project planning
- Initiate a project plan, including project analysis, scope, stakeholders and charter
- Develop a project plan, including work breakdown, budget, schedule, roles/responsibilities and communication plan
- Execute a project plan, including resource acquisition/allocation, deliverables and quality assurance
- Monitor a project plan, including performance measurement, risk management and adapting to change
- Close a project plan, including post-project review

Aligned Common Core & Washington State Standards

Art	

Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP2: Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their

	probabilities, and use this characterization to determine if they are independent.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. 11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.

	9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 33: Applied Project Management (FIRST® Tech Challenge Competition)

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Student will develop and execute a detailed project plan for a *FIRST*® Tech Challenge competition

Leadership Alignment:

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs
2.C.2 Analyze and evaluate major alternative points of view
2.C.3 Synthesize and make connections between information and arguments
2.C.4 Interpret information and draw conclusions based on the best an
1.A.1 Use a wide range of idea creation techniques (such as brainstorming) 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways
2.D.2 Identify and ask significant questions that clarify various points of view
2.C.5 Reflect critically on learning experiences and processes
10.B.1 Demonstrate additional attributes associated with producing high quality products including the abilities to:
10.B.1.a Work positively and ethically
10.B.1.b Manage time and projects effectively
10.B.1.c Multi-task
10.B.1.d Participate actively, as well as be reliable and punctual
10.B.1.e Present oneself professionally and with proper etiquette
10.B.1.f Collaborate and cooperate effectively with teams
10.B.1.g Respect and appreciate team diversity
10.B.1.h Be accountable for results
3.B.1 Demonstrate ability to work effectively and respectfully with diverse teams
3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
3.B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member
9.B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
9.B.2 Respond open-mindedly to different ideas and values

Standards and Competencies

Standard/Unit:
Initiate and develop a detailed project plan for a *FIRST*® Tech Challenge competition
Execute and monitor a detailed project plan a *FIRST*® Tech Challenge competition
Close out a project plans for a *FIRST*® Tech Challenge competition

Competencies	**Total Learning Hours for Unit: 30**

- Initiate a FTC project plan, including detailed project analysis and stakeholder identification/buy-in
- Develop a FTC project plan, including work breakdown, budget, schedule, roles/responsibilities and communication plan
- Execute a FTC project plan, including resource acquisition/allocation, deliverables and quality assurance
- Monitor a FTC project plan, including performance measurement, risk management and adapting to change
- Close a FTC project plan, including post-project review and documentation of learning/best-known-methods

Aligned Common Core & Washington State Standards

Art	

Communications	9-10SL1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 11-12SL1: Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. 9-10SL2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. 11-12SL2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. 9-10SL4:Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. 11-12SL4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. 9-10SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. 11-12SL5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Educational Technology	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. 1.3.2: 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 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning. 2.3.1: Select and use common applications. 2.4.1: Formulate and synthesize new knowledge.
Health and Fitness	
Math	N-Q1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q2: Define appropriate quantities for the purpose of descriptive modeling. N-Q3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. A-SSE1: Interpret expressions that represent a quantity in terms of its context. A-CED1: Create equations and inequalities in one variable and use them to solve problems. A-CED3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. A-CED4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. A-REI3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.. F-BF1: Write a function that describes a relationship between two quantities. F-LE1: Distinguish between situations that can be modeled with linear functions and with exponential functions. F-LE5: Interpret the parameters in a linear or exponential function in terms of a context. S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID9: Distinguish between correlation and causation. S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-CP2: Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their

	probabilities, and use this characterization to determine if they are independent.
Reading	9-10RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone. 11-12RI4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text. 9-10RI7: Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account. 11-12RI7: Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. 9-10RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. 11-12RST1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. 9-10RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. 11-12RST3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 9-10RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*. 11-12RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*. 9-10RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. 11-12RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. 9-10RST7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. 11-12RST7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. 9-10RST9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. 11-12RST9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. 9-10RST10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently. 11-12RST10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.
Science	9-12SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. 9-12SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. 9-12SYSC: In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. 9-12INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. 9-12INQE: The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.

	9-12INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. 9-12INQG: Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. 9-12INQH: Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. 9-12APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. 9-12APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. 9-12APPD: The ability to solve problems is greatly enhanced by use of mathematics and information technologies. 9-12APPE: Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. 9-12APPF: It is important for all citizens to apply science and technology to critical issues that influence society.
Social Studies	
Writing	9-12WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 9-12WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 9-12WHST5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 9-10WHST6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. 11-12WHST6: 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. 9-12WHST10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

The 21st Century Skills should be taught and assessed throughout the course. This table should be included at the end of this document.

21st Century Skills		
Check those that students will demonstrate in this course:		
LEARNING & INNOVATION **Creativity and Innovation** ☒Think Creatively ☒Work Creatively with Others ☒Implement Innovations **Critical Thinking and Problem Solving** ☒Reason Effectively ☒**U**se Systems Thinking ☒Make Judgments and Decisions ☒Solve Problems **Communication and Collaboration** ☒Communicate Clearly ☒Collaborate with Others	**INFORMATION, MEDIA & TECHNOLOGY SKILLS** **Information Literacy** ☒Access and /evaluate Information ☒Use and Manage Information **Media Literacy** ☐Analyze Media ☒Create Media Products **Information, Communications and Technology (ICT Literacy)** ☒Apply Technology Effectively	**LIFE & CAREER SKILLS** **Flexibility and Adaptability** ☒Adapt to Change ☒Be Flexible **Initiative and Self-Direction** ☒Manage Goals and Time ☒Work Independently ☒Be Self-Directed Learners **Social and Cross-Cultural** ☒Interact Effectively with Others ☒Work Effectively in Diverse Teams **Productivity and Accountability** ☒Manage Projects ☒Produce Results **Leadership and Responsibility** ☒Guide and Lead Others ☒Be Responsible to Others