



## Everett Public Schools Framework: Middle School Robotics

**Course:** Middle School Robotics

**Total Framework Hours up to: 180**

**CIP Code: 150406**

☒ **Exploratory** ☐ **Preparatory**

**Date Last Modified: 1/6/14**

**Career Cluster: STEM**

**Cluster Pathway: Engineering & Technology**

### Course Resources

This is a STEM course which teaches Science, Technology, Engineering and Math concepts through the [hardware](#) and [software](#) of the LEGO® MINDSTORMS® NXT platform.

Many of the programming lessons use the *NXT Video Trainer 2.0* product from the Carnegie Mellon Robotics Academy® which is available for free [online](#) or for purchase on [DVD](#).

The units in this framework are aligned with the [Scope and Sequence](#) of STEM Robotics 101 master curriculum.

Each unit is broken down into lessons.

Each lesson contains an Overview, Objectives, Instructor's Guide, Primary Instructional Material and Formative/Summative Assessments.

The structure, conventions and layout of STEM Robotics 101 curriculum are summarized on [this page](#).

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

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Student will demonstrate knowledge and skills of Robotics lab safety. Student will present a plan to pursue a self-selected STEM career pathway.	
<b>Leadership Alignment:</b> 1.1 Analyze, refine and apply decision-making skills 1.3 Demonstrate oral, interpersonal, written and electronic communication and presentation skills 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions 1.6 Conduct self in a professional manner in practical career applications, organizational forums, and decision-making goals;	
Standards and Competencies	
<b>Standard/Unit:</b> Describe health and safety procedures in a NXT Robotics lab. Identify STEM careers and pathways.	
Competencies	Total Learning Hours for Unit: 10
<ul style="list-style-type: none"> <li>Identify health and safety risks in a NXT Robotics lab</li> <li>Explain health and safety procedures which address risks in a NXT Robotics lab</li> <li>Describe the breadth of possible STEM careers</li> <li>Identify and explore a STEM career related to an area of student interest</li> <li>Explain the education pathway to a given STEM career</li> </ul>	
Aligned Common Core & Washington State Standards	
<b>Art</b>	4.5.1: Applies and analyzes how arts knowledge, skills, and work habits are needed and used in the world of work.
<b>Communications</b>	SL6-2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study. SL7-2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. SL8-2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. SL6-4: Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation. SL7-4: Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation. SL8-4: Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation
<b>Educational Technology</b>	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
<b>Health and Fitness</b>	
<b>Math</b>	6SP5: Summarize numerical data sets in relation to their context.
<b>Reading</b>	6-8RST1: Cite specific textual evidence to support analysis of science and technical texts. 6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). 6-8RST9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from

	reading a text on the same topic.
<b>Science</b>	<p>6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system</p> <p>6-8SYSF: The natural and designed world is complex; it is too large and complicated to investigate and comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation.</p> <p>6-8APPA: People have always used technology to solve problems. Advances in human civilization are linked to advances in technology.</p> <p>6-8APPB: Scientists and technological designers (including engineers) have different goals. Scientists answer questions about the natural world; technological designers solve problems that help people reach their goals.</p> <p>6-8APPC: Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods.</p> <p>6-8PS3E: Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</p> <p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>

## Unit 2: Introduction to Robotics

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Student will create a research report on real and fictional robots. Student will demonstrate key attributes of NXT components. Student will assemble a NXT golfing machine.	
<b>Leadership Alignment:</b> 1.3 Demonstrate oral, interpersonal, written and electronic communication and presentation skills 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals	
Standards and Competencies	
<b>Standard/Unit:</b> Describe characteristics of robots and explain/use NXT components	
Competencies	Total Learning Hours for Unit: 10
<ul style="list-style-type: none"> <li>Identify characteristics of a robot</li> <li>Create a research report on important/iconic robotics, both real and fictional</li> <li>Describe how the functions and characteristics of a robot can be seen in the NXT system</li> <li>Explain the sense and response systems of the NXT system</li> <li>Document/describe key attributes of the NXT electronic, mechanical and structural components</li> <li>Explain the function of a two-gear gear train through the bicycle analogy</li> <li>Construct an NXT Golfing Machine based on Faraday's Principle</li> </ul>	
Aligned Common Core & Washington State Standards	
<b>Art</b>	4.5.1: Applies and analyzes how arts knowledge, skills, and work habits are needed and used in the world of work.
<b>Communications</b>	SL6-2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study. SL7-2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. SL8-2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
<b>Educational Technology</b>	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.2.1: Communicate and collaborate to learn with others. 1.3.2: Locate and organize information from a variety of sources and media.
<b>Health and Fitness</b>	
<b>Math</b>	6RP3: Use ratio and rate reasoning to solve real-world and mathematical problems. 7RP2: Recognize and represent proportional relationships between quantities.
<b>Reading</b>	6-8RST1: Cite specific textual evidence to support analysis of science and technical texts. 6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. 6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). 6-8RST9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
<b>Science</b>	6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system 6-8APPA: People have always used technology to solve problems. Advances in human civilization are linked to advances in technology. 6-8APPC: Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods.

	<p>6-8 PS1B: Friction is a force that can help objects start moving, stop moving, slow down, or can change the direction of the object's motion.</p> <p>6-8PS1C: Unbalanced forces will cause changes in the speed or direction of an object's motion.</p> <p>6-8PS3E: Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.</p>
<b>Social Studies</b>	4.1.1: Analyzes a major historical event and how it is represented on timelines from different cultural perspectives.
<b>Writing</b>	<p>WHST6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</p> <p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p>

## Unit 3: Circuits and Computers

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Student will build NXT circuits and run test programs on the NXT processor	
<b>Leadership Alignment:</b> 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals 2.6 Use knowledge, build interest, guide, influence decisions, organize efforts, and involve members of a group to assure that a pre-planned group activity is completed	
Standards and Competencies	
<b>Standard/Unit:</b> Build Robotic circuits and run robotics programs	
<b>Competencies</b>	<b>Total Learning Hours for Unit: 10</b>
<ul style="list-style-type: none"> <li>Explain the four parts of a circuit and give examples of each</li> <li>Differentiate between insulators, conductors and semiconductors</li> <li>Describe how the NXT acts as a circuit</li> <li>List examples of insulators, conductors and semiconductors within the NXT system</li> <li>Explain the advantage of each of the NXT power source options</li> <li>Build five NXT test circuits to demonstrate the capabilities of the various sensors</li> <li>Explain the four reasons tube based computers stagnated and how the transistor solved these issues</li> <li>Define and explain Moore's Law</li> <li>Describe the four parts of a computer</li> <li>Distinguish between the different type of storage in a computer</li> <li>Describe how the NXT acts as a computer and the role of its different types of memory chips</li> <li>Run five NXT test programs and identify the parts of the NXT computer used by each</li> </ul>	
Aligned Common Core & Washington State Standards	
<b>Art</b>	
<b>Communications</b>	SL6-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL7-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL8-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
<b>Educational Technology</b>	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.
<b>Health and Fitness</b>	
<b>Math</b>	6NS5: Understand that positive and negative numbers are used together to describe quantities having opposite directions or use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. 6EE1: Write and evaluate numerical expressions involving whole-number exponents. 7NS1: Apply & extend previous understandings of addition & subtraction to add & subtract rational numbers. 7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers. 8EE3: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. 8EE4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are

	used.
<b>Reading</b>	<p>6-8RST1: Cite specific textual evidence to support analysis of science and technical texts.</p> <p>6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> <p>6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p>
<b>Science</b>	<p>6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system</p> <p>6-8SYSF: The natural and designed world is complex; it is too large and complicated to investigate and comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation.</p> <p>6-8APPA: People have always used technology to solve problems. Advances in human civilization are linked to advances in technology.</p> <p>6-8APPC: Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods.</p> <p>6-8PS2C: All matter is made of atoms. Matter made of only one type of atom is called an element.</p> <p>6-8PS3A: Energy exists in many forms: heat, light, chemical, electrical, motion of objects, and sound. Energy can be transformed from one form to another and transferred from one place to another.</p> <p>6-8PS3E: Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.</p>
<b>Social Studies</b>	4.1.1: Analyzes a major historical event and how it is represented on timelines from different cultural perspectives.
<b>Writing</b>	<p>WHST6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</p> <p>WHST10: 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.</p>

## Unit 4: Hardware, Software, Firmware

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Students will build a robot and write simple programs to control it using firmware	
<b>Leadership Alignment:</b> 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals	
Standards and Competencies	
<b>Standard/Unit:</b> Understand the roles of hardware, software and firmware, and how they interact in the NXT	
Competencies	Total Learning Hours for Unit: 10
<ul style="list-style-type: none"> <li>Describe the role of each of the three parts of a microprocessor's hardware</li> <li>Describe the nature and role of software in a microprocessor</li> <li>Explain how a microprocessor's hardware and software work together</li> <li>Update the NXT firmware and use it to explore the NXT systems and run test programs</li> <li>Use the NXT firmware to explore the NXT systems and run test programs</li> <li>Use the NXT hardware to build a robot from pictorial instructions</li> <li>Write 5-step on-board programs for the NXT using firmware capability</li> </ul>	
Aligned Common Core & Washington State Standards	
<b>Art</b>	
<b>Communications</b>	SL6-2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study. SL7-2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. SL8-2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
<b>Educational Technology</b>	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.
<b>Health and Fitness</b>	
<b>Math</b>	6EE1: Write and evaluate numerical expressions involving whole-number exponents. 7NS1: Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers. 7NS2: Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. 7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers. 8EE3: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. 8EE4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.
<b>Reading</b>	6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. 6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). 6-8RST9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
<b>Science</b>	6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system



	<p>6-8SYSF: The natural and designed world is complex; it is too large and complicated to investigate and comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation.</p> <p>6-8APPA: People have always used technology to solve problems. Advances in human civilization are linked to advances in technology.</p> <p>6-8PS3E: Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p>

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

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Student will manipulate the straight movement of a robot through programming parameters	
<b>Leadership Alignment:</b> 1.1 Analyze, refine and apply decision-making skills 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals	
Standards and Competencies	
<b>Standard/Unit:</b> Program a robot for precise forward and reverse motion. Determine and use the relationship between power level and travel time/speed	
<b>Competencies</b>	<b>Total Learning Hours for Unit: 15</b>
<ul style="list-style-type: none"> <li>Manipulate the Video Trainer software</li> <li>Download a program from NXT-G to a robot</li> <li>Calculate program parameters based on the circumference of a circle</li> <li>Program a robot for precision forward and reverse motion</li> <li>Measure, plot and interpolate travel time vs power level data</li> <li>Calculate, plot and interpolate speed vs power level data</li> </ul>	
Aligned Common Core & Washington State Standards	
<b>Art</b>	
<b>Communications</b>	SL6-2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study. SL7-2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. SL8-2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
<b>Educational Technology</b>	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning.
<b>Health and Fitness</b>	
<b>Math</b>	6RP1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. 6RP2: Understand the concept of a unit rate $a/b$ associated with a ratio $a:b$ with $b \neq 0$ , and use rate language in the context of a ratio relationship. 6RP3: Use ratio and rate reasoning to solve real-world and mathematical problems. 6EE5: Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? 6EE8: Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. 6EE9: Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze relationships between the dependent & independent variables using graphs & tables, relate these to the equation. 7RP1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or

	<p>different units.</p> <p>7RP2: Recognize and represent proportional relationships between quantities.</p> <p>7RP3: Use proportional relationships to solve multistep ratio and percent problems.</p> <p>7NS1: Apply &amp; extend previous understandings of addition &amp; subtraction to add &amp; subtract rational numbers.</p> <p>7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p>7EE3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p> <p>7EE4: Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.</p> <p>7G4: Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.</p> <p>8EE5: Graph proportional relationships, interpreting the unit rate as the slope of the graph.</p> <p>8EE7: Solve linear equations in one variable.</p> <p>8SP3: Use equation of a linear model to solve problems in context of bivariate measurement data, interpreting the slope &amp; intercept.</p>
<b>Reading</b>	6-8RST1: Cite specific textual evidence to support analysis of science and technical texts.
<b>Science</b>	<p>6-8 INQA: Generate a question that can be answered through scientific investigation.</p> <p>6-8 INQC: Collecting, analyzing, and displaying data are essential aspects of all investigations</p> <p>6-8 INQD: For an experiment to be valid, all (controlled) variables must be kept the same whenever possible, except for the manipulated (independent) variable being tested and the responding (dependent) variable being measured and recorded.</p> <p>6-8 INQE: Create a model or simulation to represent the behavior of objects, events, systems, or processes. Use the model to explore the relationship between two variables and point out how the model or simulation is similar to or different from the actual phenomenon.</p> <p>6-8 PS1A: Average speed is defined as the distance traveled in a given period of time.</p> <p>6-8 PS1B: Friction is a force that can help objects start moving, stop moving, slow down, or can change the direction of the object's motion.</p> <p>6-8PS1C: Unbalanced forces will cause changes in the speed or direction of an object's motion.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>WHST6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</p>

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

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> 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	
<b>Leadership Alignment:</b> 1.1 Analyze, refine and apply decision-making skills 1.3 Demonstrate oral, interpersonal, written and electronic communication and presentation skills 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals 2.2 Demonstrate knowledge of conflict resolution and challenge management 2.6 Use knowledge, build interest, guide, influence decisions, organize efforts, and involve members of a group to assure that a pre-planned group activity is completed	
Standards and Competencies	
<b>Standard/Unit:</b> Build robots to responds to light and sound. Calculate and use gear ratios to optimize robot performance	
Competencies	Total Learning Hours for Unit: 15
<ul style="list-style-type: none"> <li>Explain each parameter of the light sensor configuration panel</li> <li>Calculate a light sensor threshold</li> <li>Program a robot to respond to the light sensor</li> <li>Explain each parameter of the sound block (audible output) configuration panel</li> <li>Program a robot to respond to give an audible response</li> <li>Explain each parameter of the sound sensor configuration panel</li> <li>Calculate a sound sensor threshold</li> <li>Program a robot to respond to the sound sensor</li> <li>Explain the timing sensitivity of the sound sensor</li> <li>Explain gearing up and down in relation to speed and torque</li> <li>Calculate gear ratios</li> <li>Describe the difference between Science and Engineering</li> <li>Build a robot using the Engineering Process which incorporates precision forward motion, gear ratios, light and sound sensors</li> </ul>	
Aligned Common Core & Washington State Standards	
Art	
Communications	SL6-2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study. SL7-2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. SL8-2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation. SL6-4: Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation. SL7-4: Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation. SL8-4: Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

	<p>SL6-5: Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.</p> <p>SL7-5: Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.</p> <p>SL8-5: Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.</p> <p>SL6-6: Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 6 Language standards 1 and 3 on page 52 for specific expectations.)</p> <p>SL7-6: Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 7 Language standards 1 and 3 on page 52 for specific expectations.)</p> <p>SL8-6: Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 8 Language standards 1 and 3 on page 52 for specific expectations.)</p>
<b>Educational Technology</b>	<p>1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools.</p> <p>1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities.</p> <p>1.2.1: Communicate and collaborate to learn with others.</p> <p>1.3.2: Locate and organize information from a variety of sources and media.</p> <p>1.3.3: Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results</p> <p>2.2.1: Develop skills to use technology effectively.</p> <p>2.2.2: Use a variety of hardware to support learning.</p> <p>2.3.1: Select and use common applications.</p> <p>2.4.1: Formulate and synthesize new knowledge.</p>
<b>Health and Fitness</b>	
<b>Math</b>	<p>6RP1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.</p> <p>6RP2: Understand the concept of a unit rate <math>a/b</math> associated with a ratio <math>a:b</math> with <math>b \neq 0</math>, and use rate language in the context of a ratio relationship.</p> <p>6RP3: Use ratio and rate reasoning to solve real-world and mathematical problems.</p> <p>6EE5: Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true?</p> <p>6EE8: Write an inequality of the form <math>x &gt; c</math> or <math>x &lt; c</math> to represent a constraint or condition in a real-world or mathematical problem.</p> <p>7RP1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.</p> <p>7RP2: Recognize and represent proportional relationships between quantities.</p> <p>7RP3: Use proportional relationships to solve multistep ratio and percent problems.</p> <p>7NS1: Apply &amp; extend previous understandings of addition &amp; subtraction to add &amp; subtract rational numbers.</p> <p>7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p>7EE3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p>
<b>Reading</b>	<p>RI6-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</p> <p>RI7-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.</p> <p>RI8-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.</p> <p>6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> <p>6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p>
<b>Science</b>	<p>6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system</p> <p>6-8APPB: Scientists and technological designers (including engineers) have different goals. Scientists answer questions about the natural world; technological designers solve problems that help people reach their goals.</p>

	<p>6-8APPC: Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods.</p> <p>6-8 APPD: The process of technological design begins by defining a problem and identifying criteria for a successful solution, followed by research to better understand the problem and brainstorming to arrive at potential solutions.</p> <p>6-8 APPE: Scientists and engineers often work together to generate creative solutions to problems and decide which ones are most promising.</p> <p>6-8 APPF: Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.</p> <p>6-8 PS1A: Average speed is defined as the distance traveled in a given period of time.</p> <p>6-8 PS1B: Friction is a force that can help objects start moving, stop moving, slow down, or can change the direction of the object's motion.</p> <p>6-8 PS1C: Unbalanced forces will cause changes in the speed or direction of an object's motion. The motion of an object will stay the same when forces are balanced.</p> <p>6-8 PS1D: The same unbalanced force will change the motion of an object with more mass more slowly than an object with less mass.</p> <p>6-8PS3A: Energy exists in many forms: heat, light, chemical, electrical, motion of objects, and sound. Energy can be transformed from one form to another and transferred from one place to another.</p> <p>6-8PS3D: Visible light from the Sun is made up of a mixture of all colors of light. To see an object, light emitted or reflected by that object must enter the eye.</p> <p>6-8PS3F: Energy can be transferred from one place to another through waves. Waves include vibrations in materials. Sound and earthquake waves are examples. These and other waves move at different speeds in different materials.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>WHST6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</p>

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

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Student will design and build a robot to maneuver through turns, control an appendage, and design a program from a flow chart	
<b>Leadership Alignment:</b> 1.1 Analyze, refine and apply decision-making skills; 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions; 1.6 Conduct self in a professional manner in practical career applications, organizational forums, and decision-making goals; 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals; 2.6 Use knowledge, build interest, guide, influence decisions, organize efforts, and involve members of a group to assure that a pre-planned group activity is completed	
Standards and Competencies	
<b>Standard/Unit:</b> Build robots capable of precision maneuvers, including movable appendages. Plan and develop linear programs.	
Competencies	Total Learning Hours for Unit: 15
<ul style="list-style-type: none"> <li>Explain how each parameter of the Move Block can be configured to control a robot's turning response</li> <li>Write a program for a robot to maneuver with turns</li> <li>Write a program for a robot to maneuver with various precision turns</li> <li>Write a program for a robot to combine turning and sensor response</li> <li>Create a flowchart to represent a multi-step activity</li> <li>Develop a robot program from a flow chart</li> <li>Explain each parameter of the Motor Block</li> <li>Write a program using the Motor Block to control a third motor in a robot</li> <li>Design, build and program a robot to write block characters on a horizontal dry-erase board</li> </ul>	
Aligned Common Core & Washington State Standards	
Art	2.3.1: Applies a responding process to a presentation/exhibit of visual art
Communications	SL6-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL7-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL8-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
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	6RP1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. 6RP2: Understand the concept of a unit rate $a/b$ associated with a ratio $a:b$ with $b \neq 0$ , and use rate language in the context of a ratio relationship. 6RP3: Use ratio and rate reasoning to solve real-world and mathematical problems. 6EE5: Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? 6EE8: Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. 7RP1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or

	<p>different units.</p> <p>7RP2: Recognize and represent proportional relationships between quantities.</p> <p>7RP3: Use proportional relationships to solve multistep ratio and percent problems.</p> <p>7NS1: Apply &amp; extend previous understandings of addition &amp; subtraction to add &amp; subtract rational numbers.</p> <p>7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p>7EE3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p> <p>7G4: Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.</p>
<b>Reading</b>	<p>6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> <p>6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p> <p>6-8RST9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.</p>
<b>Science</b>	<p>6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system</p> <p>6-8 INQA: Generate a question that can be answered through scientific investigation.</p> <p>6-8 INQE: Create a model or simulation to represent the behavior of objects, events, systems, or processes. Use the model to explore the relationship between two variables and point out how the model or simulation is similar to or different from the actual phenomenon.</p> <p>6-8APPA: People have always used technology to solve problems. Advances in human civilization are linked to advances in technology.</p> <p>6-8APPB: Scientists and technological designers (including engineers) have different goals. Scientists answer questions about the natural world; technological designers solve problems that help people reach their goals.</p> <p>6-8 APPF: Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.</p> <p>6-8 PS1B: Friction is a force that can help objects start moving, stop moving, slow down, or can change the direction of the object's motion.</p> <p>6-8PS1C: Unbalanced forces will cause changes in the speed or direction of an object's motion.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>WHST5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</p>



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

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Student will design and build a robot to use all four sensors and create programs with repeating behaviors	
<b>Leadership Alignment:</b> 1.1 Analyze, refine and apply decision-making skills; 1.3 Demonstrate oral, interpersonal, written and electronic communication and presentation skills 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions; 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals; 2.6 Use knowledge, build interest, guide, influence decisions, organize efforts, and involve members of a group to assure that a pre-planned group activity is completed	
Standards and Competencies	
<b>Standard/Unit:</b> 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
<ul style="list-style-type: none"> <li>Describe how computers use digital information to represent numbers, words and images</li> <li>Explain why computers only use digital information</li> <li>Explain each parameter of the touch sensor configuration panel</li> <li>Program a robot to respond to the touch sensor</li> <li>Explain each parameter of the ultrasonic sensor configuration panel</li> <li>Program a robot to respond to the ultrasonic sensor</li> <li>Explain each parameter of the loop configuration panel</li> <li>Program a robot for repeating behavior controlled by timers, counters and sensors</li> <li>Design, build and program an animatronic robot which resembles and behaves like a selected animal</li> </ul>	
Aligned Common Core & Washington State Standards	
Art	
Communications	SL6-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL7-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL8-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL6-5: Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information. SL7-5: Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. SL8-5: Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and 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.

<b>Health and Fitness</b>	
<b>Math</b>	<p>6RP1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.</p> <p>6RP3: Use ratio and rate reasoning to solve real-world and mathematical problems.</p> <p>6EE5: Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true?</p> <p>6EE8: Write an inequality of the form <math>x &gt; c</math> or <math>x &lt; c</math> to represent a constraint or condition in a real-world or mathematical problem.</p> <p>7RP2: Recognize and represent proportional relationships between quantities.</p> <p>7RP3: Use proportional relationships to solve multistep ratio and percent problems.</p> <p>7NS1: Apply &amp; extend previous understandings of addition &amp; subtraction to add &amp; subtract rational numbers.</p> <p>7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p>7EE3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p>
<b>Reading</b>	<p>6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> <p>6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p> <p>6-8RST9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.</p>
<b>Science</b>	<p>6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system</p> <p>6-8SYSF: The natural and designed world is complex; it is too large and complicated to investigate and comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation.</p> <p>6-8APPB: Scientists and technological designers (including engineers) have different goals. Scientists answer questions about the natural world; technological designers solve problems that help people reach their goals.</p> <p>6-8 APPD: The process of technological design begins by defining a problem and identifying criteria for a successful solution, followed by research to better understand the problem and brainstorming to arrive at potential solutions.</p> <p>6-8 APPE: Scientists and engineers often work together to generate creative solutions to problems and decide which ones are most promising.</p> <p>6-8 APPF: Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.</p> <p>6-8PS3D: Visible light from the Sun is made up of a mixture of all colors of light. To see an object, light emitted or reflected by that object must enter the eye.</p> <p>6-8PS3E: Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.</p> <p>6-8PS3F: Energy can be transferred from one place to another through waves. Waves include vibrations in materials. Sound and earthquake waves are examples. These and other waves move at different speeds in different materials.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>WHST5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</p> <p>WHST10: 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.</p>

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

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Student will design and build a robot that makes decisions based on sensory input	
<b>Leadership Alignment:</b> 1.1 Analyze, refine and apply decision-making skills; 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions; 1.6 Conduct self in a professional manner in practical career applications, organizational forums, and decision-making goals; 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals; 2.6 Use knowledge, build interest, guide, influence decisions, organize efforts, and involve members of a group to assure that a pre-planned group activity is completed	
Standards and Competencies	
<b>Standard/Unit:</b> 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
<ul style="list-style-type: none"> <li>Explain each parameter of the switch block configuration panel</li> <li>Program a robot to make decisions based on sensory input</li> <li>Explain how a fast switch block nested inside a loop improves detection behavior</li> <li>Build and program a robot to continuously detect objects</li> <li>Build and program a robot to follow a line</li> <li>Create a flow chart to design a hierarchical program</li> <li>Design, build and program a sumobot robot which pushes an opponent out of an arena</li> </ul>	
Aligned Common Core & Washington State Standards	
Art	
Communications	SL6-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL7-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL8-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL6-5: Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information. SL7-5: Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. SL8-5: Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and 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	

<b>Math</b>	<p>6RP1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.</p> <p>6RP3: Use ratio and rate reasoning to solve real-world and mathematical problems.</p> <p>6EE5: Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true?</p> <p>6EE8: Write an inequality of the form <math>x &gt; c</math> or <math>x &lt; c</math> to represent a constraint or condition in a real-world or mathematical problem.</p> <p>7RP1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.</p> <p>7RP2: Recognize and represent proportional relationships between quantities.</p> <p>7RP3: Use proportional relationships to solve multistep ratio and percent problems.</p> <p>7NS1: Apply &amp; extend previous understandings of addition &amp; subtraction to add &amp; subtract rational numbers.</p> <p>7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p>7EE3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p>
<b>Reading</b>	<p>6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> <p>6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p> <p>6-8RST9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.</p>
<b>Science</b>	<p>6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system</p> <p>6-8SYSF: The natural and designed world is complex; it is too large and complicated to investigate and comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation.</p> <p>6-8APPB: Scientists and technological designers (including engineers) have different goals. Scientists answer questions about the natural world; technological designers solve problems that help people reach their goals.</p> <p>6-8 APPD: The process of technological design begins by defining a problem and identifying criteria for a successful solution, followed by research to better understand the problem and brainstorming to arrive at potential solutions.</p> <p>6-8 APPE: Scientists and engineers often work together to generate creative solutions to problems and decide which ones are most promising.</p> <p>6-8 APPF: Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.</p> <p>6-8 PS1B: Friction is a force that can help objects start moving, stop moving, slow down, or can change the direction of the object's motion.</p> <p>6-8 PS1C: Unbalanced forces will cause changes in the speed or direction of an object's motion. The motion of an object will stay the same when forces are balanced.</p> <p>6-8 PS1D: The same unbalanced force will change the motion of an object with more mass more slowly than an object with less mass.</p> <p>6-8PS3D: Visible light from the Sun is made up of a mixture of all colors of light. To see an object, light emitted or reflected by that object must enter the eye.</p> <p>6-8PS3E: Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.</p> <p>6-8PS3F: Energy can be transferred from one place to another through waves. Waves include vibrations in materials. Sound and earthquake waves are examples. These and other waves move at different speeds in different materials.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>WHST5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</p>

	WHST10: 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.
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## Unit 10: Get a Grip (using gripper arms and my blocks)

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Student will design and build a robot that manipulates objects with a gripper attachment.	
<b>Leadership Alignment:</b> 1.1 Analyze, refine and apply decision-making skills; 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions; 1.6 Conduct self in a professional manner in practical career applications, organizational forums, and decision-making goals; 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals; 2.6 Use knowledge, build interest, guide, influence decisions, organize efforts, and involve members of a group to assure that a pre-planned group activity is completed	
Standards and Competencies	
<b>Standard/Unit:</b> Build robots that can grip and manipulate objects. Plan and develop hierarchical programs.	
<b>Competencies</b>	<b>Total Learning Hours for Unit: 15</b>
<ul style="list-style-type: none"> <li>Describe how computers chip are designed and manufactured</li> <li>Explain why computers chips are manufactured in "clean rooms"</li> <li>Build a robot with a gripper attachment</li> <li>Program a robot to coordinate object manipulation with sensor input</li> <li>Design a hierarchical program using my blocks</li> <li>Design, build and program a robot capable of sorting objects by color</li> </ul>	
Aligned Common Core & Washington State Standards	
<b>Art</b>	
<b>Communications</b>	SL6-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL7-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. SL8-1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
<b>Educational Technology</b>	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 2.2.1: Develop skills to use technology effectively. 2.2.2: Use a variety of hardware to support learning.
<b>Health and Fitness</b>	
<b>Math</b>	6RP1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. 6RP3: Use ratio and rate reasoning to solve real-world and mathematical problems. 6EE1: Write and evaluate numerical expressions involving whole-number exponents. 6EE5: Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? 6EE8: Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. 7RP1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. 7RP2: Recognize and represent proportional relationships between quantities.

	<p>7RP3: Use proportional relationships to solve multistep ratio and percent problems.</p> <p>7NS1: Apply &amp; extend previous understandings of addition &amp; subtraction to add &amp; subtract rational numbers.</p> <p>7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p>7EE3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p> <p>8EE3: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.</p> <p>8EE4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.</p>
<b>Reading</b>	<p>6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p> <p>6-8RST7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p> <p>6-8RST9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.</p>
<b>Science</b>	<p>6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system</p> <p>6-8SYSF: The natural and designed world is complex; it is too large and complicated to investigate and comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation.</p> <p>6-8APPB: Scientists and technological designers (including engineers) have different goals. Scientists answer questions about the natural world; technological designers solve problems that help people reach their goals.</p> <p>6-8 APPD: The process of technological design begins by defining a problem and identifying criteria for a successful solution, followed by research to better understand the problem and brainstorming to arrive at potential solutions.</p> <p>6-8 APPE: Scientists and engineers often work together to generate creative solutions to problems and decide which ones are most promising.</p> <p>6-8 APPF: Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.</p> <p>6-8 PS1B: Friction is a force that can help objects start moving, stop moving, slow down, or can change the direction of the object's motion.</p> <p>6-8 PS1C: Unbalanced forces will cause changes in the speed or direction of an object's motion. The motion of an object will stay the same when forces are balanced.</p> <p>6-8 PS1D: The same unbalanced force will change the motion of an object with more mass more slowly than an object with less mass.</p> <p>6-8PS3D: Visible light from the Sun is made up of a mixture of all colors of light. To see an object, light emitted or reflected by that object must enter the eye.</p> <p>6-8PS3E: Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.</p> <p>6-8PS3F: Energy can be transferred from one place to another through waves. Waves include vibrations in materials. Sound and earthquake waves are examples. These and other waves move at different speeds in different materials.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>WHST5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</p> <p>WHST10: 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.</p>

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

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Student will design and build a robot that use parameters passed from one block of their program to another.	
<b>Leadership Alignment:</b> 1.1 Analyze, refine and apply decision-making skills; 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions; 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals; 2.6 Use knowledge, build interest, guide, influence decisions, organize efforts, and involve members of a group to assure that a pre-planned group activity is completed	
Standards and Competencies	
<b>Standard/Unit:</b> 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.	
<b>Competencies</b>	<b>Total Learning Hours for Unit: 15</b>
<ul style="list-style-type: none"> <li>Describe the purpose of a Data Hub in NXT-G</li> <li>Explain the parameters on the Move Block Data Hub</li> <li>Program a robot to move with a parameter driven from a Data Hub</li> <li>Explain the different Data Types in NXT-G</li> <li>Program a robot to display number-type data using Data Hubs and Conversion Blocks</li> <li>Design a hierarchical program which passes parameters using data wires with advanced my blocks</li> <li>Design, build and program a robot capable of line following under remote control</li> </ul>	
Aligned Common Core & Washington State Standards	
<b>Art</b>	
<b>Communications</b>	SL6-2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study. SL7-2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. SL8-2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
<b>Educational Technology</b>	1.1.1: Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2: Use models and simulations to explore systems, identify trends, and forecast possibilities. 1.2.1: Communicate and collaborate to learn with others. 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.
<b>Health and Fitness</b>	
<b>Math</b>	6RP1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. 6RP3: Use ratio and rate reasoning to solve real-world and mathematical problems. 6EE5: Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? 6EE6: Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number. 6EE8: Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem.



	<p>6EE9: Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze relationships between the dependent &amp; independent variables using graphs &amp; tables, relate these to the equation.</p> <p>7RP2: Recognize and represent proportional relationships between quantities.</p> <p>7RP3: Use proportional relationships to solve multistep ratio and percent problems.</p> <p>7NS1: Apply &amp; extend previous understandings of addition &amp; subtraction to add &amp; subtract rational numbers.</p> <p>7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p>7EE3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p> <p>7EE4: Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.</p> <p>8F1: Understand that a function is a rule that assigns to each input exactly one output.</p>
Reading	<p>RI6-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</p> <p>RI7-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.</p> <p>RI8-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.</p> <p>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.</p> <p>RI7-7: Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).</p> <p>RI8-7: Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.</p> <p>RI6-9: Compare and contrast one author's presentation of events with that of another (e.g., a memoir written by and a biography on the same person).</p> <p>RI7-9: Analyze how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.</p> <p>RI8-9: Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.</p> <p>6-8RST4: 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 <i>grades 6–8 texts and topics</i>.</p> <p>6-8RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.</p> <p>6-8RST9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.</p> <p>6-8RST10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.</p>
Science	<p>6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system</p> <p>6-8SYSF: The natural and designed world is complex; it is too large and complicated to investigate and comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation.</p> <p>6-8APPB: Scientists and technological designers (including engineers) have different goals. Scientists answer questions about the natural world; technological designers solve problems that help people reach their goals.</p> <p>6-8 APPD: The process of technological design begins by defining a problem and identifying criteria for a successful solution, followed by research to better understand the problem and brainstorming to arrive at potential solutions.</p> <p>6-8 APPE: Scientists and engineers often work together to generate creative solutions to problems and decide which ones are most promising.</p>

	<p>6-8 APPF: Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.</p> <p>6-8 PS1B: Friction is a force that can help objects start moving, stop moving, slow down, or can change the direction of the object's motion.</p> <p>6-8 PS1C: Unbalanced forces will cause changes in the speed or direction of an object's motion. The motion of an object will stay the same when forces are balanced.</p> <p>6-8 PS1D: The same unbalanced force will change the motion of an object with more mass more slowly than an object with less mass.</p> <p>6-8PS3D: Visible light from the Sun is made up of a mixture of all colors of light. To see an object, light emitted or reflected by that object must enter the eye.</p> <p>6-8PS3E: Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.</p> <p>6-8PS3F: Energy can be transferred from one place to another through waves. Waves include vibrations in materials. Sound and earthquake waves are examples. These and other waves move at different speeds in different materials.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>WHST5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</p> <p>WHST10: 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.</p>

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

COMPONENTS AND ASSESSMENTS	
<b>Performance Assessments:</b> Student will design and build a robot that uses variable parameters, algebraic calculations and Boolean logic.	
<b>Leadership Alignment:</b> 1.1 Analyze, refine and apply decision-making skills; 1.3 Demonstrate oral, interpersonal, written and electronic communication and presentation skills; 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions; 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals; 2.6 Use knowledge, build interest, guide, influence decisions, organize efforts, and involve members of a group to assure that a pre-planned group activity is completed	
Standards and Competencies	
<b>Standard/Unit:</b> 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
<ul style="list-style-type: none"> <li>Describe the purpose of a Variable Block in NXT-G</li> <li>Explain the parameters on the Variable Block</li> <li>Program a robot to write and read variables</li> <li>Program a robot to display variables on the NXT screen</li> <li>Describe the purpose of a Math Block in NXT-G</li> <li>Explain the parameters on the Math Block</li> <li>Program a robot to respond to algebraic combinations of variables using Math Blocks</li> <li>Describe the Boolean logic data type and operators in NXT-G</li> <li>Explain the Boolean logic data plugs in various NXT-G blocks</li> <li>Program a robot to respond to a logic-controlled Loop Block</li> </ul>	
Aligned Common Core & Washington State Standards	
Art	
Communications	SL6-2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study. SL7-2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study. SL8-2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
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	<p>6NS1: Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.</p> <p>6NS5: Understand that positive and negative numbers are used together to describe quantities having opposite directions or use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.</p> <p>6NS7: Understand ordering and absolute value of rational numbers.</p> <p>6EE2: Write, read, and evaluate expressions in which letters stand for numbers.</p> <p>6EE5: Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true?</p> <p>6EE6: Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number.</p> <p>6EE7: Solve real-world and mathematical problems by writing and solving equations of the form <math>x + p = q</math> and <math>px = q</math> for cases in which <math>p</math>, <math>q</math> and <math>x</math> are all nonnegative rational numbers.</p> <p>6EE8: Write an inequality of the form <math>x &gt; c</math> or <math>x &lt; c</math> to represent a constraint or condition in a real-world or mathematical problem.</p> <p>6EE9: Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze relationships between the dependent &amp; independent variables using graphs &amp; tables, relate these to the equation.</p> <p>7NS1: Apply &amp; extend previous understandings of addition &amp; subtraction to add &amp; subtract rational numbers.</p> <p>7NS2: Apply &amp; extend previous understandings of multiplication &amp; division &amp; of fractions to multiply &amp; divide rational numbers.</p> <p>7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p>7EE3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p> <p>7EE4: Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.</p> <p>8F1: Understand that a function is a rule that assigns to each input exactly one output.</p> <p>8F4: Construct a function to model a linear relationship between two quantities.</p>
Reading	<p>RI6-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</p> <p>RI7-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.</p> <p>RI8-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.</p> <p>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.</p> <p>RI7-7: Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).</p> <p>RI8-7: Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.</p> <p>RI6-9: Compare and contrast one author's presentation of events with that of another (e.g., a memoir written by and a biography on the same person).</p> <p>RI7-9: Analyze how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.</p> <p>RI8-9: Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.</p> <p>6-8RST4: 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 <i>grades 6–8 texts and topics</i>.</p> <p>6-8RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.</p>

	<p>6-8RST9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.</p> <p>6-8RST10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.</p>
<b>Science</b>	<p>6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system</p> <p>6-8SYSF: The natural and designed world is complex; it is too large and complicated to investigate and comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation.</p> <p>6-8APPB: Scientists and technological designers (including engineers) have different goals. Scientists answer questions about the natural world; technological designers solve problems that help people reach their goals.</p> <p>6-8 APPD: The process of technological design begins by defining a problem and identifying criteria for a successful solution, followed by research to better understand the problem and brainstorming to arrive at potential solutions.</p> <p>6-8 APPE: Scientists and engineers often work together to generate creative solutions to problems and decide which ones are most promising.</p> <p>6-8 APPF: Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.</p> <p>6-8 PS1B: Friction is a force that can help objects start moving, stop moving, slow down, or can change the direction of the object's motion.</p> <p>6-8 PS1C: Unbalanced forces will cause changes in the speed or direction of an object's motion. The motion of an object will stay the same when forces are balanced.</p> <p>6-8 PS1D: The same unbalanced force will change the motion of an object with more mass more slowly than an object with less mass.</p> <p>6-8PS3D: Visible light from the Sun is made up of a mixture of all colors of light. To see an object, light emitted or reflected by that object must enter the eye.</p> <p>6-8PS3E: Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.</p> <p>6-8PS3F: Energy can be transferred from one place to another through waves. Waves include vibrations in materials. Sound and earthquake waves are examples. These and other waves move at different speeds in different materials.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>WHST5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</p> <p>WHST10: 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.</p>

## 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:

- 1.1 Analyze, refine and apply decision-making skills
- 1.3 Demonstrate oral, interpersonal, written and electronic communication and presentation skills
- 1.4 Be involved in activities that require applying theory, problem-solving and using critical thinking skills while understanding the outcomes of related decisions
- 1.6 Conduct self in a professional manner in practical career applications, organizational forums, and decision-making goals;
- 2.1 Communicate, participate, and advocate effectively in pairs, small groups, teams and large groups in order to reach common goals
- 2.2 Demonstrate knowledge of conflict resolution and challenge management
- 2.6 Use knowledge, build interest, guide, influence decisions, organize efforts, and involve members of a group to assure that a pre-planned group activity is completed

### 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: 20**

- 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	SL6-2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
	SL7-2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
	SL8-2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
	SL6-5: Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
	SL7-5: Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
Educational Technology	SL8-5: Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest
	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

	<p>2.2.1: Develop skills to use technology effectively.</p> <p>2.2.2: Use a variety of hardware to support learning.</p> <p>2.3.1: Select and use common applications.</p> <p>2.4.1: Formulate and synthesize new knowledge.</p>
<b>Health and Fitness</b>	
<b>Math</b>	<p>6RP1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.</p> <p>6RP2: Understand the concept of a unit rate <math>a/b</math> associated with a ratio <math>a:b</math> with <math>b \neq 0</math>, and use rate language in the context of a ratio relationship.</p> <p>6RP3: Use ratio and rate reasoning to solve real-world and mathematical problems.</p> <p>7RP1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.</p> <p>7RP2: Recognize and represent proportional relationships between quantities.</p> <p>7RP3: Use proportional relationships to solve multistep ratio and percent problems.</p> <p>6NS1: Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.</p> <p>6NS5: Understand that positive and negative numbers are used together to describe quantities having opposite directions or use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.</p> <p>6NS7: Understand ordering and absolute value of rational numbers.</p> <p>7NS1: Apply &amp; extend previous understandings of addition &amp; subtraction to add &amp; subtract rational numbers.</p> <p>7NS2: Apply &amp; extend previous understandings of multiplication &amp; division &amp; of fractions to multiply &amp; divide rational numbers.</p> <p>7NS3: Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p>8NS1: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.</p> <p>6EE1: Write and evaluate numerical expressions involving whole-number exponents.</p> <p>6EE2: Write, read, and evaluate expressions in which letters stand for numbers.</p> <p>6EE5: Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true?</p> <p>6EE6: Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number.</p> <p>6EE7: Solve real-world and mathematical problems by writing and solving equations of the form <math>x + p = q</math> and <math>px = q</math> for cases in which <math>p</math>, <math>q</math> and <math>x</math> are all nonnegative rational numbers.</p> <p>6EE8: Write an inequality of the form <math>x &gt; c</math> or <math>x &lt; c</math> to represent a constraint or condition in a real-world or mathematical problem.</p> <p>6EE9: Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze relationships between the dependent &amp; independent variables using graphs &amp; tables, relate these to the equation.</p> <p>7EE3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</p> <p>7EE4: Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.</p> <p>8EE3: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.</p> <p>8EE4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.</p> <p>8EE5: Graph proportional relationships, interpreting the unit rate as the slope of the graph.</p>

	<p>8EE7: Solve linear equations in one variable.</p> <p>8F1: Understand that a function is a rule that assigns to each input exactly one output.</p> <p>8F3: Interpret the equation <math>y = mx + b</math> as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.</p> <p>8F4: Construct a function to model a linear relationship between two quantities.</p> <p>8F5: Describe qualitatively the functional relationship between two quantities by analyzing a graph.</p> <p>6SP5: Summarize numerical data sets in relation to their context.</p> <p>7SP5: Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around <math>\frac{1}{2}</math> indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.</p> <p>8SP2: Know that straight lines are widely used to model relationships between two quantitative variables.</p> <p>8SP3: Use equation of a linear model to solve problems in context of bivariate measurement data, interpreting the slope &amp; intercept.</p>
Reading	<p>R16-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</p> <p>R17-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.</p> <p>R18-4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.</p> <p>R16-7: 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.</p> <p>R17-7: Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).</p> <p>R18-7: Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.</p> <p>R16-9: Compare and contrast one author's presentation of events with that of another (e.g., a memoir written by and a biography on the same person).</p> <p>R17-9: Analyze how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.</p> <p>R18-9: Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.</p> <p>6-8RST4: 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 <i>grades 6–8 texts and topics</i>.</p> <p>6-8RST6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.</p> <p>6-8RST9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.</p> <p>6-8RST10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.</p>
Science	<p>6-8SYSA: Any system may be thought of as containing subsystems and as being a subsystem of a larger system</p> <p>6-8SYSF: The natural and designed world is complex; it is too large and complicated to investigate and comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation.</p> <p>6-8INQA: Generate a question that can be answered through scientific investigation.</p> <p>6-8INQB: Different kinds of questions suggest different kinds of scientific investigations.</p> <p>6-8INQC: Collecting, analyzing, and displaying data are essential aspects of all investigations</p> <p>6-8INQD: For an experiment to be valid, all (controlled) variables must be kept the same whenever possible, except for the manipulated (independent) variable being tested and the responding (dependent) variable being measured and recorded.</p> <p>6-8INQE: Create a model or simulation to represent the behavior of objects, events, systems, or processes. Use the model to explore the relationship between two variables and point out how the model or simulation is similar to or different from the actual phenomenon.</p>



	<p>6-8 INQF: It is important to distinguish between the results of a particular investigation and general conclusions drawn from these results.</p> <p>6-8 INQG: Scientific reports should enable another investigator to repeat the study to check the results.</p> <p>6-8INQH: Engage in reflection and self-evaluation.</p> <p>6-8APPA: People have always used technology to solve problems. Advances in human civilization are linked to advances in technology.</p> <p>6-8APPB: Scientists and technological designers (including engineers) have different goals. Scientists answer questions about the natural world; technological designers solve problems that help people reach their goals.</p> <p>6-8APPC: Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods.</p> <p>6-8 APPD: The process of technological design begins by defining a problem and identifying criteria for a successful solution, followed by research to better understand the problem and brainstorming to arrive at potential solutions.</p> <p>6-8 APPE: Scientists and engineers often work together to generate creative solutions to problems and decide which ones are most promising.</p> <p>6-8 APPF: Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.</p> <p>6-8 PS1A: Average speed is defined as the distance traveled in a given period of time.</p> <p>6-8 PS1B: Friction is a force that can help objects start moving, stop moving, slow down, or can change the direction of the object's motion.</p> <p>6-8 PS1C: Unbalanced forces will cause changes in the speed or direction of an object's motion. The motion of an object will stay the same when forces are balanced.</p> <p>6-8 PS1D: The same unbalanced force will change the motion of an object with more mass more slowly than an object with less mass.</p> <p>6-8 PS2A: Substances have characteristic intrinsic properties such as density, solubility, boiling point, and melting point, all of which are independent of the amount of the sample.</p> <p>6-8PS3A: Energy exists in many forms: heat, light, chemical, electrical, motion of objects, and sound. Energy can be transformed from one form to another and transferred from one place to another.</p> <p>6-8 PS3B: Heat (thermal energy) flows from warmer to cooler objects until both reach the same temperature. Conduction, radiation, and convection, or mechanical mixing, are means of energy transfer.</p> <p>6-8 PS3C: Heat (thermal energy) consists of random motion and the vibrations of atoms and molecules. The higher the temperature, the greater the atomic or molecular motion. Thermal insulators are materials that resist the flow of heat.</p> <p>6-8 PS3D: Visible light from the Sun is made up of a mixture of all colors of light. To see an object, light emitted or reflected by that object must enter the eye.</p> <p>6-8PS3E: Energy from a variety of sources can be transformed into electrical energy, and then to almost any other form of energy. Electricity can also be distributed quickly to distant locations.</p> <p>6-8PS3F: Energy can be transferred from one place to another through waves. Waves include vibrations in materials. Sound and earthquake waves are examples. These and other waves move at different speeds in different materials.</p> <p>6-8 ES2A: The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has different properties at different elevations.</p> <p>6-8 ES2D: Water is a solvent. As it passes through the water cycle, it dissolves minerals and gases and carries them to the oceans.</p>
<b>Social Studies</b>	
<b>Writing</b>	<p>WHST4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>WHST5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</p> <p>WHST10: 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.</p>

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

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