## Seattle Public Schools

## Computer Programming

| Course: Computer Programming | | | Total Framework Hours up to: 1170 | |
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| CIP Code: 110201 ☐ Exploratory ☒ Preparatory | | | Date Last Modified: 01/14/2014 | |
| Career Cluster: Information Technology | | | Cluster Pathway: Programming | |

| Exploring CS | | Intro to CS | |
|---|---|---|---|
| Programming Concepts | 3 | Programming Concepts | 3 |
| Security and Risk Awareness Issues | 2 | Security and Risk Awareness Issues | 2 |
| Project Management | 5 | Project Management | 5 |
| Computer Programing Theory | 5 | Computer Programing Theory | 5 |
| Technical Documentation | 4 | Technical Documentation | 4 |
| Plan Programs | 8 | Plan Programs | 8 |
| Develop Programs | 33 | Develop Programs | 33 |
| Implement and Manage Software | 5 | Implement and Manage Software | 5 |
| Test Software throughout Software Development    Process | 5 | Test Software throughout Software Development Process | 5 |
| Computer Architecture | 5 | Computer Architecture | 5 |
| Computing in Society | 5 | Computing in Society | 5 |
| Operating Systems | 5 | Operating Systems | 5 |
| Networked Systems | 5 | Networked Systems | 5 |
| **TOTAL** | **90** | **TOTAL** | **90** |

| Exploring CS Mobile | | AP Computer Science 1 & 2 | 0.16 |
|---|---|---|---|
| Programming Concepts | 3 | Programming Concepts | 5 |
| Security and Risk Awareness Issues | 2 | Security and Risk Awareness Issues | 4 |
| Project Management | 5 | Project Management | 5 |
| Computer Programing Theory | 5 | Computer Programing Theory | 10 |
| Technical Documentation | 4 | Technical Documentation | 8 |
| Plan Programs | 4 | Plan Programs | 15 |
| Develop Programs | 34 | Develop Programs | 80 |
| Implement and Manage Software | 5 | Implement and Manage Software | 5 |

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| Test Software throughout Software Development Process | 5 | Test Software throughout Software Development Process | 10 |
| Computer Architecture | 4 | Computer Architecture | 10 |
| Computing in Society | 5 | Computing in Society | 8 |
| Operating Systems | 7 | Operating Systems | 10 |
| Networked Systems | 7 | Networked Systems | 10 |
| **TOTAL** | **90** | **TOTAL** | **180** |
| **Java 1 & 2** | | **Projects in CS 1 & 2** | |
| Programming Concepts | 6 | Programming Concepts | 5 |
| Security and Risk Awareness Issues | 4 | Security and Risk Awareness Issues | 3 |
| Project Management | 15 | Project Management | 20 |
| Computer Programing Theory | 10 | Computer Programing Theory | 5 |
| Technical Documentation | 5 | Technical Documentation | 5 |
| Plan Programs | 15 | Plan Programs | 15 |
| Develop Programs | 80 | Develop Programs | 80 |
| Implement and Manage Software | 8 | Implement and Manage Software | 7 |
| Test Software throughout Software Development Process | 10 | Test Software throughout Software Development Process | 15 |
| Computer Architecture | 5 | Computer Architecture | 9 |
| Computing in Society | 7 | Computing in Society | 5 |
| Operating Systems | 8 | Operating Systems | 5 |
| Networked Systems | 7 | Networked Systems | 6 |
| **TOTAL** | **180** | **TOTAL** | 180 |
| **IB Computer Science A, B, C, D** | 0.333 | | |
| Programming Concepts | 10 | | |
| Security and Risk Awareness Issues | 8 | | |
| Project Management | 25 | | |
| Computer Programing Theory | 20 | | |
| Technical Documentation | 15 | | |
| Plan Programs | 35 | | |
| Develop Programs | 160 | | |
| Implement and Manage Software | 15 | | |
| Test Software throughout Software Development Process | 15 | | |
| Computer Architecture | 17 | | |
| Computing in Society | 15 | | |
| Operating Systems | 15 | | |
| Networked Systems | 10 | | |

| TOTAL | 360 | |
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**Performance Assessments:** Create a flowchart;   Create a chart demonstrating applications and programming languages;   Illustrate programming structures

**Leadership Alignment:**  Leadership activity embedded in curriculum and instruction.  (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

**21st Century Skills**
2. A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation.
4. B.1 Use information accurately and creatively for the issue or problem at hand.
4. B.2 Manage the flow of information from a wide variety of sources.
4. B.3 Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information.

## Standards and Competencies

**Standard/Unit: Programming Concepts**

| Competencies | Total Learning Hours for Unit: 35 |
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- Define what a computer program is
- Define how a computer program runs
- Identify the applications appropriate for each programming language
- Define functions/methods/procedures
- Define programming structures
- Differentiate between procedural and object oriented programming
- Define purpose and use of flowcharting and pseudo code

## Common Core & Washington State Standards

| | |
|---|---|
| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.<br><br>SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.<br><br>SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br><br>SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.<br><br>SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |
| **Communications** | |

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| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. <br> 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. <br> 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources <br><br> 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. <br> 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. <br> 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. <br> 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies. |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. <br><br> L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. <br><br> L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening. <br><br> L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **CCSS Math** | |
| **CCSS Reading** | RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. <br><br> RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). <br><br> RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. <br><br> RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| **Science** | 9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. <br><br> 9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. <br><br> 9-12 SYSD Systems can be changing or in equilibrium. <br><br> 9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world. <br><br> 9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. |

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| | 9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge.<br><br>9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.<br><br>9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.<br><br>9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.<br><br>9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies.<br><br>9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.<br><br>9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society. |
| **Social Studies** | |
| **CCSS- Writing** | W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.<br><br>W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)<br><br>W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.<br><br>W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.<br><br>W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.<br><br>W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.<br><br>W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes |

| COMPONENTS AND ASSESSMENTS |
|---|
| **Performance Assessments:** Develop passwords illustrating secure pass wording strategies, Review case studies of major security breaches in recent times. Research paper and/or presentations in Security issues. |

**Leadership Alignment:** Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

**21st Century Skills**
5. A.3 Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media.
9. B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds.
9. B.2 Respond open-mindedly to different ideas and values.
11. B.1 Act responsibly with the interests of the larger community in mind.

| Standards and Competencies |
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**Standard/Unit: Security and Risk Awareness Issues**

| Competencies | Total Learning Hours for Unit: 25 |
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| <ul><li>Discuss security principles, privacy issues, vulnerability and threats</li><li>Explain principles of secure password strategies</li><li>Illustrate what fundamental legal issues involved with security management</li></ul> | |

| Common Core & Washington State Standards | |
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| **Art** | |
| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively <br><br> SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology. <br> 1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others. <br> 1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources <br><br> 2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology. <br> 2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. <br> 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively. <br> 2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies |
| **Health and Fitness** | |
| **CCSS Math** | S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems. |
| **CCSS Reading** | RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). <br><br> RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. |
| **Science** | 9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as |

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| | clearly as possible.<br><br>9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded.<br><br>9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.<br><br>9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies.<br><br>9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.<br><br>9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society. |
| **CCSS Language** | L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.<br><br>L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **Common Core State Standards- Writing** | W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.<br><br>W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)<br><br>W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.<br><br>W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.<br><br>W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.<br><br>W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research<br><br>W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes. |

| COMPONENTS AND ASSESSMENTS |
|---|
| **Performance Assessments:** Develop a project plan to manage the workflow of a project from start to finish. Monitor and complete a project on time and budget. Agile task management and back log tracking. |

**Leadership Alignment:** Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21<sup>st</sup> Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

**21<sup>st</sup> Century Skills**

1. A.1 Use a wide range of idea creation techniques (such as brainstorming).
1. A.2 Create new and worthwhile ideas (both incremental and radical concepts).
1. A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts.
1. B.1 Develop, implement and communicate new ideas to others effectively.
1. B.2 Be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work.
1. B.3 Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas.
1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes *I*
1. C.1 Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur.
2. D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways.
2. D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions.
3. B.1 Demonstrate ability to work effectively and respectfully with diverse teams.
3. B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal.
3. B.3 Assume shared responsibility for collaborative work, and value the individual contributions made by each team member.
7. A.1 Adapt to varied roles, jobs responsibilities, schedules and contexts.
7. A.2 Work effectively in a climate of ambiguity and changing priorities.
8. A.1 Set goals with tangible and intangible success criteria.
8. A.2 Balance tactical (short-term) and strategic (long-term) goals.
8. A.3 Utilize time and manage workload efficiently.
8. B.1 Monitor defines, prioritize and complete tasks without direct oversight.
9. A.1 Know when it is appropriate to listen and when to speak.
9. A.2 Conduct themselves in a respectable, professional manner.
10. A.1 Set and meet goals, even in the face of obstacles and competing pressures.
10. A.2 Prioritize, plan and manage work to achieve the intended result.
11. A.1 Use interpersonal and problem-solving skills to influence and guide others toward a goal.
11. A.2 Leverage strengths of others to accomplish a common goal.
11. A.3 Inspire others to reach their very best via example and selflessness.
11. A.4 Demonstrate integrity and ethical behavior in using influence and power.
11. B.1 Act responsibly with the interests of the larger community in mind.

| Standards and Competencies |
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**Standard/Unit: Project Management**

| Competencies | Total Learning Hours for Unit: 80 |
|---|---|
| <ul><li>Define scope of work to achieve individual and group goals.</li><li>Identify stakeholders and decision makers.</li><li>Identify escalation procedures.</li><li>Develop work breakdown structures.</li><li>Evaluate project requirements.</li><li>Identify required resources and budget.</li><li>Estimate time requirements.</li><li>Develop initial project management flow chart.</li><li>Identify interdependencies within a project management plan.</li></ul> | |

- Identify and track critical milestones.
- Evaluate risks and prepare contingency plan.
- Participate in project phase review and report project status.
- Identify project management software.
- Develop method of evaluation.
- Formulate a task strategy.
- Prioritize tasks according to customer needs.
- Devise plan of action.
- Identify means of managing change.

| Common Core & Washington State Standards | |
|---|---|
| **Art** | |
| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.<br><br>SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.<br><br>SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br><br>SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.<br><br>SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |
| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.<br>1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.<br>1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources<br><br>2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.<br>2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.<br>2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.<br>2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies. |
| **Health and Fitness** | |
| **CCSS Math** | N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.<br><br>N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.<br><br>N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.<br><br>S-CP.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as |

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| | unions, intersections, or complements of other events ("or," "and," "not"). |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **Science** | 9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.

9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.

9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world.

9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.

9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.

9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings.

9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information.

9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded.

9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.

9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.

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9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. |

| | 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society. |
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| **CCSS Reading** | RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.<br><br>RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).<br><br>RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in<br><br>RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| **CCSS Writing** | W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.<br><br>W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)<br><br>W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.<br><br>W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.<br><br>W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.<br><br>W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research<br><br>W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes |

| COMPONENTS AND ASSESSMENTS |
|---|
| **Performance Assessments:** Develop algorithms, class structure diagrams and code solutions |
| **Leadership Alignment:** Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy) |

**21st Century Skills**

2. A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation.

2. C.1 Effectively analyzes and evaluates evidence, arguments, claims and beliefs.

2. C.3 Synthesize and make connections between information and arguments.

4. A.2 Evaluate information critically and competently.

| Standards and Competencies |
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**Standard/Unit:  Computer Programming Theory**

| Competencies | Total Learning Hours for Unit: 60 |
|---|---|

- Describe the relationship between hardware and software.
- Analyze programming languages for uses, structure, and environment.
- Classify the various programming languages by communication level.
- Summarize the function and operation of compilers and interpreters.
- List the stages of program development.
- Analyze a problem identifying desired outputs for given inputs.
- Describe the fundamental data types and their operations (including arrays).
- Design program logic using graphical techniques (flow charts).
- Design program logic using pseudo code techniques.
- Identify the use of program design tools.
- Explain structured/modular programming.
- Describe the information system (IS) life cycle.
- List the characteristics and uses of batch processing.
- List the characteristics and uses of interactive processing.
- List the characteristics and uses of event-driven, object-oriented procession.
- Illustrate characteristics of technical documentation associated with software development.
- Understand the complexity and efficiency of given algorithms.

| Common Core & Washington State Standards | |
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| Art | |
| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |

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| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.<br>1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.<br>1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.<br><br>2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.<br>2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.<br>2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.<br>2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies. |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.<br><br>L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.<br><br>L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.<br><br>L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **CCSS Math** | N-RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.<br><br>N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.<br><br>N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.<br><br>N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.<br><br>N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.<br><br>A-CED.1. Create equations and inequalities in one variable and use them to solve problems.<br><br>A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.<br><br>A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.<br><br>A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.<br><br>F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.<br><br>F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. |

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| | F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.<br><br>F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.<br><br>F-BF.1. Write a function that describes a relationship between two quantities.<br><br>F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.<br><br>F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table.<br><br>F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.<br><br>F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.<br><br>F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table.<br><br>F-LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.<br><br>F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.<br><br>S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems. |
| **CCSS Reading** | RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.<br><br>RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).<br><br>RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in.<br><br>RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| **Science** | 9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. |

| | 9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. |
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| | 9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. |
| | 9-12 SYSD Systems can be changing or in equilibrium. |
| | 9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world. |
| | 9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. |
| | 9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge. |
| | 9-12 INQD Communicate Clearly the methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation. |
| | 9-12 INQE Model the essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. |
| | 9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. |
| | 9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. |
| | 9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. |
| | 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. |
| | 9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. |
| | 9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. |
| | 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. |
| | 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. |
| | 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society. |
| **Social Studies** | |

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| **CCSS Writing** | W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.<br><br>W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)<br><br>W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.<br><br>W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.<br><br>W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.<br><br>W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.<br><br>W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes. |

## COMPONENTS AND ASSESSMENTS

**Performance Assessments:**  Present clear documentation to end users explaining the characteristics and purpose of the program.

**Leadership Alignment:**  Leadership activity embedded in curriculum and instruction.  (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

**21st Century Skills**
1.A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts.
2.C.5 Reflect critically on learning experiences and processes.
5. A.1 Understand both how and why media messages are constructed, and for what purposes.
5. B.1 Understand and utilize the most appropriate media creation tools, characteristics and conventions.

## Standards and Competencies

**Standard/Unit: Technical Documentation**

| Competencies | Total Learning Hours for Unit: 45 |
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| <ul><li>Prepare a technical documentation report that is clear, concise, accurate, complete, appropriate, and grammatically correct.</li><li>Describe the contents, characteristics and the purpose of network documentation, user documentation, troubleshooting logs, and maintenance logs.</li><li>Evaluate technical documentation and provide revision recommendations.</li></ul> | |

## Common Core & Washington State Standards

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| **Art** | |

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| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.<br><br>SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.<br><br>SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br><br>SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.<br><br>SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |
| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.<br>1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.<br>1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.<br><br>2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.<br>2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.<br>2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.<br>2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies. |
| **Health and Fitness** | |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.<br><br>L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.<br><br>L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.<br><br>L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
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| | legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in.<br><br>RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| **Science** | 9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br><br>9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br><br>9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.<br><br>9-12 SYSD Systems can be changing or in equilibrium.<br><br>9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world.<br><br>9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data.<br><br>9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge.<br><br>9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.<br><br>9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.<br><br>9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.<br><br>9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings.<br><br>9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information.<br><br>9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded.<br><br>9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.<br><br>9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. |

| | 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. |
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| | 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. |
| | 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society. |
| **Social Studies** | |
| **CCSS Writing** | W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.<br><br>W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)<br><br>W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.<br><br>W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.<br><br>W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.<br><br>W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research<br><br>W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes |

### COMPONENTS AND ASSESSMENTS

**Performance Assessments:** Formulate a problem statement, project proposal and make a plan to solve the problem

**Leadership Alignment:** Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

**21st Century Skills**
2. B.1 Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems.
3. A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts.
3. A.2 Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions.
4. B.1 Use information accurately and creatively for the issue or problem at hand.

### Standards and Competencies

**Standard/Unit: Plan Programs**

| Competencies | Total Learning Hours for Unit: 100 |
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- Develop a problem statement.
- Define the assumptions that define the scope of the problem.
- List strategies used to gather known information.
- Apply known information to the problem statement.
- Hypothesize expected output.
- Evaluate the viability of proposed solutions.

| Common Core & Washington State Standards | |
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| **Art** | |
| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.<br><br>SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.<br><br>SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br><br>SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.<br><br>SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |
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| **CCSS Math** | N-RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. |

N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.

N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

A-CED.1. Create equations and inequalities in one variable and use them to solve problems.

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A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

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F-BF.1. Write a function that describes a relationship between two quantities.

F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table.

F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.

F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table.

F-LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

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| | W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) |
| | W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| | W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| | W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| | W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research. |
| | W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes. |

**COMPONENTS AND ASSESSMENTS**

**Performance Assessments:** Write effective and concise code following standard coding conventions

**Leadership Alignment:** Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

**21st Century Skills**
4. A.1 Access information efficiently (time) and effectively (sources).
6. A.1 Use technology as a tool to research, organize, evaluate and communicate information.
7. A.1 Adapt to varied roles, jobs responsibilities, schedules and contexts.
7. A.2 Work effectively in a climate of ambiguity and changing priorities.
8. A.1 Set goals with tangible and intangible success criteria.
8. A.2 Balance tactical (short-term) and strategic (long-term) goals.
8. A.3 Utilize time and manage workload efficiently.
8. B.1 Monitor defines, prioritize and complete tasks without direct oversight.
8. C.1 Go beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise.
8. C.2 Demonstrate initiative to advance skill levels towards a professional level.
8. C.3 Demonstrate commitment to learning as a lifelong process.
8. C.4 Reflect critically on past experiences in order to inform future progress.
9. A.1 Know when it is appropriate to listen and when to speak.
9. A.2 Conduct themselves in a respectable, professional manner.

| Standards and Competencies |
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**Standard/Unit: Develop Programs**

| Competencies | Total Learning Hours for Unit: 500 |
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- Develop programs using desired language.
- Develop programs that use arithmetic operations.
- Develop programs that use relational operators.
- Explain and apply the use of logical operators.
- Explain and apply compound conditions.
- Explain and apply control breaks.
- Explain and apply methods of calculating subtotals and final totals.
- Explain and apply iterative and conditional loops.
- Describe common development environments.
- Explain and apply the use of sort and search routines.
- Explain and apply the use of files in programming.
- Explain and apply appropriate methods of memory management.
- Develop interactive programs.
- Explain and apply the use of appropriate data structures, which may include arrays, linked lists, queues, and stacks.
- Design and develop classes, subclasses.
- Instantiate objects.
- Explain and apply methods of incorporating error handling routines.
- Define and apply built-in functions.
- Create user-defined functions.
- Apply language specific programming techniques.
- Test and run a program for desired output.
- Explain and apply methods used to debug a program.

- Utilize reference materials for problem solving.
- Provide internal documentation.

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| **Common Core & Washington State Standards** | |
| **Art** | |
| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.<br><br>SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.<br><br>SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br><br>SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.<br><br>SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |
| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.<br>1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.<br>1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.<br><br>2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.<br>2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.<br>2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.<br>2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.<br><br>L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.<br><br>L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.<br><br>L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **CCSS Math** | N-RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.<br><br>N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.<br><br>N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.<br>N-Q.2. Define appropriate quantities for the purpose of descriptive modeling. |

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| | N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. |
| | A-CED.1. Create equations and inequalities in one variable and use them to solve problems. |
| | A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. |
| | A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. |
| | A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. |
| | F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. |
| | F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. |
| | F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. |
| | F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. |
| | F-BF.1. Write a function that describes a relationship between two quantities. |
| | F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. |
| | F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table. |
| | F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context. |
| | F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions. |
| | F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table. |
| | F-LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. |
| | F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context. |
| | S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems. |
| **CCSS Reading** | RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. |

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| | RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in.

RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| **Science** | 9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.

9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.

9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.

9-12 SYSD Systems can be changing or in equilibrium.

9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world.

9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data.

9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge.

9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.

9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.
9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.

9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings.

9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. |

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| | 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded.<br><br>9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.<br><br>9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design.<br><br>9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies.<br><br>9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not.<br><br>9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society. |
| **Social Studies** | |
| **CCSS Writing** | W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.<br><br>W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)<br><br>W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.<br><br>W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.<br><br>W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.<br><br>W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.<br><br>W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes. |

**COMPONENTS AND ASSESSMENTS**

**Performance Assessments:** Finish projects with documentation describing installation, use and maintenance

**Leadership Alignment:** Leadership activity embedded in curriculum and instruction.  (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

**21st Century Skills**

7. A.1 Adapt to varied roles, jobs responsibilities, schedules and contexts.
8. A.1 Set goals with tangible and intangible success criteria.
8. A.2 Balance tactical (short-term) and strategic (long-term) goals.
8. A.3 Utilize time and manage workload efficiently.
8. B.1 Monitor defines, prioritize and complete tasks without direct oversight.
8. C.1 Go beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise.
8. C.2 Demonstrate initiative to advance skill levels towards a professional level.
8. C.3 Demonstrate commitment to learning as a lifelong process.
8. C.4 Reflect critically on past experiences in order to inform future progress.

| Standards and Competencies |
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**Standard/Unit: Implement and Manage Software**

| Competencies | Total Learning Hours for Unit: 50 |
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- Demonstrate ability to work on a software development team
- Identify sources and techniques used to gather information needed for implementation
- Explain and demonstrate a program's use/function
- Plan and write end user documentation
- List and apply methods used to troubleshoot compatibility issues of hardware and software
- Disable/uninstall software that may interfere with installation of a program
- Document installation and configuration procedures
- Explain and demonstrate methods to verify software/program installation and operation
- Identify the issues of security in programming and software implementation
- Explain the importance of versioning and source code control
- Generate packaged code ready for delivery
- Explain release management
- Explain and apply methods used to maintain application/program

| Common Core & Washington State Standards | |
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| **Art** | |
| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively

SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |

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| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.<br>1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.<br>1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources<br><br>2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.<br>2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.<br>2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.<br>2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies. |
| **Health and Fitness** | |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.<br><br>L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.<br><br>L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.<br><br>L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **CCSS Reading** | RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.<br><br>RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).<br><br>RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in.<br><br>RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| **Science** | 9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br><br>9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br><br>9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.<br><br>9-12 SYSD Systems can be changing or in equilibrium. |

| | 9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world. |
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| | 9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. |
| | 9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge. |
| | 9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation. |
| | 9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. |
| | 9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. |
| | 9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. |
| | 9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. |
| | 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. |
| | 9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. |
| | 9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. |
| | 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. |
| | 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. |
| | 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society. |
| **Social Studies** | |
| **CCSS Writing** | W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. |
| | W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) |
| | W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |

| | W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
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| | W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| | W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research. |
| | W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes. |

## COMPONENTS AND ASSESSMENTS

**Performance Assessments:** Create and implement a testing plan for a program. Develop Unit Tests

**Leadership Alignment:** Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy).

**21st Century Skills**
1. A.3 Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts.
1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes
2. A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation.
10. B.1h Be accountable for results.

## Standards and Competencies

**Standard/Unit:  Test Software throughout Software Development Process**

| Competencies | Total Learning Hours for Unit: 65 |
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- Create a testing plan.
- Implement a testing plan.
- Demonstrate ability to provide feedback to the development process.

## Common Core & Washington State Standards

| Art | |
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| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. |
| | SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| | SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style |

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| | are appropriate to purpose, audience, and a range of formal and informal tasks.<br><br>SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.<br><br>SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |
| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.<br>1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.<br>1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.<br><br>2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.<br>2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.<br>2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.<br>2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies. |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.<br><br>L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.<br><br>L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.<br><br>L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **CCSS Math** | N-RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.<br><br>N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.<br><br>N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.<br><br>N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.<br><br>N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.<br><br>A-CED.1. Create equations and inequalities in one variable and use them to solve problems.<br><br>A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.<br><br>A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.<br><br>A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. |

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| | F-IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

F-IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F-IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

F-BF.1. Write a function that describes a relationship between two quantities.

F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

F-LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table.

F-LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
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F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.

S-CP.9. Use permutations and combinations to compute probabilities of compound events and solve problems.
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| **CCSS Reading** | RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in.

RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| **Science** | 9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. |

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| | 9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. |
| | 9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. |
| | 9-12 SYSD Systems can be changing or in equilibrium. |
| | 9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world. |
| | 9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. |
| | 9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge. |
| | 9-12 INQD Communicate Clearly the methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation. |
| | 9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. |
| | 9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. |
| | 9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. |
| | 9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. |
| | 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. |
| | 9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. |
| | 9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. |
| | 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. |
| | 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. |
| | 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society. |
| **Social Studies** | |

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| **CCSS Writing** | W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes. |

## COMPONENTS AND ASSESSMENTS

**Performance Assessments:**  Make appropriate decisions in programming based on computer architecture;  Diagram a computer

**Leadership Alignment:**  Leadership activity embedded in curriculum and instruction.  (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

**21st Century Skills**
2. B.1 Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems.
6. A.1 Use technology as a tool to research, organize, evaluate and communicate information.

## Standards and Competencies

**Standard/Unit: Computer Architecture**

| Competencies | Total Learning Hours for Unit: 55 |
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- Outline the structure of the central processing unit (CPU) including the functions of the control unit (CU), the arithmetic and logic
- unit (ALU), primary memory and address buses
- Outline the meaning of the terms bit (b) and byte (B) and their derivatives.
- Outline the meaning of the terms word, register and address and their use in the storage of data and instructions.
- Outline the steps in the machine instruction cycle:  fetch, decode, execute and store.
- Outline the characteristics of primary memory and the difference between volatile and non-volatile memory.
- Outline the characteristics of secondary memory and define sequential and direct access.
- Outline the function of a microprocessor designed to perform one or a limited number of functions (within a car, washing machine and so on).
- Discuss the features, advantages, disadvantages and applications of specific input and output devices and the media used by each.
- Outline recent developments in computer system architecture including processor architecture, primary memory technologies and secondary memory devices.

## Common Core & Washington State Standards

| Art | |
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| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.<br><br>SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.<br><br>SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br><br>SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.<br><br>SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |
| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.<br>1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.<br>1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources.<br><br>2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.<br>2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.<br>2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.<br>2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.<br><br>L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.<br><br>L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.<br><br>L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **CCSS Math** | A-CED.1. Create equations and inequalities in one variable and use them to solve problems.<br><br>A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.<br><br>A-REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.<br>. |
| **CCSS Reading** | RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.<br><br>RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical |

| | meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). |
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| | RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| **Science** | 9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system. |
| | 9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible. |
| | 9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. |
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| | 9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. |
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| | 9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. |
| | 9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. |
| | 9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. |
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| | 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. |

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| | 9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. |
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| | 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. |
| | 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. |
| | 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society. |
| **Social Studies** | |
| **CCSS Writing** | W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. |
| | W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) |
| | W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
| | W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| | W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| | W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research. |
| | W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes. |

| COMPONENTS AND ASSESSMENTS |
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| **Performance Assessments:** Demonstrate what constitutes appropriate use of technology to make ethical decisions. |
| **Leadership Alignment:** Leadership activity embedded in curriculum and instruction. (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy).<br><br>**21st Century Skills**<br>2. C.1 Effectively analyzes and evaluate evidence, arguments, claims and beliefs.<br>2. C.2 Analyze and evaluate major alternative points of view. |

2. C.4 Interpret information and draw conclusions based on the best analysis.
2. D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions.
3. A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts.
4. A.2 Evaluate information critically and competently.
5. A.1 Understand both how and why media messages are constructed, and for what purposes.
5. A.2 Examine how individuals interpret messages differently, how values and points of view are included or excluded, and how media can influence beliefs and behaviors.
5. A.3 Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media
6. A.3 Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies.
9. B.1 Respect cultural differences and work effectively with people from a range of social and cultural backgrounds.
9. B.2 Respond open-mindedly to different ideas and values.
9. B.3 Leverage social and cultural differences to create new ideas and increase both innovation and quality of work.

| Standards and Competencies |
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**Standard/Unit: Computing and Society**

| Competencies | Total Learning Hours for Unit: 50 |
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- Analyze the influence of computing technologies on culture and commerce
- Discuss ethical and unethical uses of computing technology
- Describe emerging technologies and their anticipated impact
- Explain the pros and cons of hacking and cracking

| Common Core & Washington State Standards | |
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| **Art** | |
| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively<br><br>SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.<br><br>SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br><br>SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.<br><br>SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |
| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.<br>1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.<br>1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources<br><br>2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.<br>2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning. |

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| | 2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.<br>2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.<br><br>L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.<br><br>L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.<br><br>L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **Math** | |
| **CCSS Reading** | RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.<br><br>RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).<br><br>RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in.<br><br>RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| **Science** | 9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br><br>9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br><br>9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.<br><br>9-12 SYSD Systems can be changing or in equilibrium.<br><br>9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world.<br><br>9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data.<br><br>9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge. |

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| **Social Studies** | |
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the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research

W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes

| COMPONENTS AND ASSESSMENTS |
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**Performance Assessments:** Create a comparison chart of different kinds of computers;  Create a poster illustrating characteristics of various computer systems;  Illustrate processing characteristics and the applications that use them.

**Leadership Alignment:**  Leadership activity embedded in curriculum and instruction.  (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

**21st Century Skills**
2. B.1 Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems.

| Standards and Competencies |
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**Standard/Unit: Operating Systems**

| Competencies | Total Learning Hours for Unit: 55 |
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- Define the term "operating system".
- Outline the functions of operating systems.
- Discuss the characteristics of various computer systems including single users and multi-users, in both single-tasking and multi-tasking environments.
- Compare the characteristics and applications of different kinds of computers.
- Outline the principal characteristics of batch processing, online (interactive) processing and real-time processing.
- Outline applications that use each of the processing methods: batch processing (payroll and bank cheque processing); interactive (online) processing; word processing; computer games; real-time processing (air traffic control and monitoring of patients in hospital intensive care).
- Explain the relationship between master and transaction files.
- Discuss the reliability of the system including the implications of failure.

| Common Core & Washington State Standards |
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| Art | |
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| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively |
| | SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. |
| | SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. |
| | SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to |

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| | enhance understanding of findings, reasoning, and evidence and to add interest.<br><br>SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. |
| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.<br>1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.<br>1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources<br><br>2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.<br>2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.<br>2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.<br>2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.<br><br>L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.<br><br>L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.<br><br>L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **Math** | |
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| **Science** | 9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br><br>9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br><br>9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible. |

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| | 9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world. |
| | 9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data. |
| | 9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge. |
| | 9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation. |
| | 9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions. |
| | 9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light. |
| | 9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings. |
| | 9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information. |
| | 9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. |
| | 9-12 APPB The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions. |
| | 9-12 APPC Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. |
| | 9-12 APPD The ability to solve problems is greatly enhanced by use of mathematics and information technologies. |
| | 9-12 APPE Perfect solutions do not exist. All technological solutions involve trade-offs in which decisions to include more of one quality means less of another. All solutions involve consequences, some intended, others not. |
| | 9-12 APPF It is important for all citizens to apply science and technology to critical issues that influence society. |
| **Social Studies** | |
| **CCSS Writing** | W.11-12.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. |
| | W.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) |

| | W.11-12.6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. |
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| | W.11-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| | W.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. |
| | W.11-12.9. Draw evidence from literary or informational texts to support analysis, reflection, and research. |
| | W.11-12.10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes. |

## COMPONENTS AND ASSESSMENTS

**Performance Assessments:**  Diagram a network;    Graph data transmission

**Leadership Alignment:**  Leadership activity embedded in curriculum and instruction.  (Examples: CTSO project or activity, locally developed leadership project or activity, embedded 21st Century interdisciplinary theme activity such as global awareness, financial, economic, business & entrepreneurial literacy, civic literacy, health & safety, environmental literacy)

### 21st Century Skills
2. B.1 Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems.
4. B.2 Manage the flow of information from a wide variety of sources.
6. A.2 Use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy.

## Standards and Competencies

**Standard/Unit: Networked Systems**

| Competencies | Total Learning Hours for Unit: 50 |
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- Define local area network (LAN), wide area network (WAN), server and client.
- Explain basic network topologies.
- Explain the hardware required in networking.
- Define the terms "standard protocol", "data integrity" and "data security" in the context of data transmission across a network.
- Explain the software involved in networking.
- Describe suitable methods to ensure data integrity in the transmission of data.
- Describe suitable methods to ensure data security.
- Discuss the need for speed in data transmission, and how speed can be enhanced
- Discuss networking applications and the implications of networking for organizations, including internal communications, electronic mail, e-commerce, conferencing and distributed processing.

- Outline the functions of a web browser and search engine including displaying an HTML page, following hyperlinks and searching on key words.

| Common Core & Washington State Standards | |
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| **Art** | |
| **CCSS- Speaking and Listening** | SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively<br><br>SL.11-12.2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.<br><br>SL.11-12.4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.<br><br>SL.11-12.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.<br><br>SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate |
| **Educational Technology** | 1.1 Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.<br>1.2 Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.<br>1.3 Investigate and Think Critically: Research, manage and evaluate information and solve problems using digital tools and resources<br><br>2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.<br>2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.<br>2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.<br>2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies |
| **CCSS Language** | L.11-12.1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.<br><br>L.11-12.2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.<br><br>L.11-12.3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.<br><br>L.11-12.6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. |
| **Math** | |
| **CCSS Reading** | RI.11-12.1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.<br><br>RI.11-12.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison |

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| | defines faction in Federalist No. 10).<br><br>RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.<br><br>RI.11-12.8. Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in<br><br>RI.11-12.10. By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. |
| **Science** | 9-12 SYSA Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br><br>9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br><br>9-12 SYSC In complex systems, entirely new and unpredictable properties may emerge. Consequently, modeling a complex system in sufficient detail to make reliable predictions may not be possible.<br><br>9-12 SYSD Systems can be changing or in equilibrium.<br><br>9-12 INQA Question Scientists generate and evaluate questions to investigate the natural world.<br><br>9-12 INQB Investigate Scientific progress requires the use of various methods appropriate for answering different kinds of research questions, a thoughtful plan for gathering data needed to answer the question, and care in collecting, analyzing, and displaying the data.<br><br>9-12 INQC Explain Conclusions must be logical, based on evidence, and consistent with prior established knowledge.<br><br>9-12 INQD Communicate Clearly The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.<br><br>9-12 INQE Model The essence of scientific investigation involves the development of a theory or conceptual model that can generate testable predictions.<br><br>9-12 INQF Communicate Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.<br><br>9-12 INQG Intellectual Honesty Public communication among scientists is an essential aspect of research. Scientists evaluate the validity of one another's investigations, check the reliability of results, and explain inconsistencies in findings.<br><br>9-12 INQH Intellectual Honesty Scientists carefully evaluate sources of information for reliability before using that information. When referring to the ideas or findings of others, they cite their sources of information.<br><br>9-12 APPA Science affects society and cultures by influencing the way many people think about themselves, others, and the environment. Society also affects science by its prevailing views about what is important to study and by deciding what research will be funded. |

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| 21st Century Skills |
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| Check those that students will demonstrate in this course: |

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