Curriculum: Computational Thinking

Curricular Unit: Human Computer Interaction

Instructional Unit: A. **Investigate the major components of the computer and the suitability of these components for specific applications**

### Standard Alignments (Section 2)

<table>
<thead>
<tr>
<th>SSCLE: RIGIT.6.M (World History)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VACLE: PP.1.C (Level 4)</td>
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<tr>
<td>SCCLE: SC8.1.B</td>
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<tr>
<td>Knowledge: (SC) 8 (SS) 6</td>
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<tr>
<td>CCSS: 9-10.RST.1; 9-10.RST.3; 9-10.RST.4; 9-10.RST.7; 9-10.RST.5; 9-10.SL.1c,d; 9-10.SL.2; 9-10.SL.4; 9-10.SL.5</td>
</tr>
<tr>
<td>NETS: 1a,b; 2c; 3b-d; 5a-c; 6b</td>
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<tr>
<td>Performance: 1.1, 1.4, 2.7, 3.5</td>
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</tbody>
</table>

### Unit (Section 3)

#### Learning Targets:
- Identify the major components of the computer
- Describe hardware component uses
- Execute internet searches using various browsers and evaluate results and reliability of information

#### Instructional Strategies:
- The teacher will:
  - provide:
    - whole group instruction on major components of the computer through the use of technology
    - guided practice on major components of the computer through the use of technology
    - guided & independent practice of internet use utilizing various browsers and search engines
    - clear feedback to students for improvement
    - various opportunities for discussion so that students can receive formative feedback before being graded summatively
    - a clear scoring guide for characteristics of a trustworthy website
    - model how to execute an appropriate internet search

#### Assessments/Evaluations:
- Formative:
  - Students will list 6 components of the computer
  - Teacher observation of students as they work on their computer component buying project
- Summative: 2-person presentation on Computer Component Buying Project

Board Approved 8-3-15
Sample Assessment Questions:

- List 6 components of a computer.
- Define/list examples of a computer operating system.
- Define what a computer’s processor does and why it is important.
- List various types of browsers.

Instructional Resources/Tools:

- World Wide Web – various trusted & untrustworthy websites
- School issued iPads
- Laptops
- Course curriculum

Cross Curricular Connections

- Science & technology connection
- Visual Art: Presentations require use of creative software design tools
- ELA:
  - Reading
  - Writing
  - Researching
  - 2-person presentations

**Depth of Knowledge (Section 5)**

DOK: 2
Curriculum: Computational Thinking

Curricular Unit: Human Computer Interaction

Instructional Unit: B. **Analyze the impacts of computing within economic, social, and cultural contexts**

### Standard Alignments (Section 2)

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<th>SS克莱: RIGIT.6.M (World History)</th>
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### Unit (Section 3)

**Learning Targets:**

- Communicate and assess legal and ethical concerns raised by different computing innovations: cell phones, social networks, etc.
- Investigate implications of various forms of communication (text, e-mail, browser searches, Snapchat, Instagram, etc.) as data exchange

**Instructional Strategies:**

- The teacher will:
  - provide:
    - whole group instruction on legal and ethical issues as a result of various social networking sites and improvements in computer technology
    - guided practice on proper internet and social networking site use
    - guided and independent practice of communication methods to exchange information/data
    - clear feedback to students for improvement
    - various opportunities for discussing so that students can receive formative feedback before being graded summatively
  - model various types of communication methods

**Assessments/Evaluations:**

- Formative – students will list:
  - different types of data generated by their activity on social networking sites
  - preferred communication methods for exchanging information
- Summative: 2-person presentation defining advantages/disadvantages of information exchange and the impacts as a result of their communication choice

Board Approved 8-3-15
Sample Assessment Questions:

- List data generated by social networking activity
- Define aggregated data
- What does data mean?

Instructional Resources/Tools:

- World Wide Web: www.csd.t.rpi.edu
- School issued iPads
- Personal cell phones
- Laptops
- Course curriculum

Cross Curricular Connections

- Social Studies: Ethical issues
- Visual Art: Presentations require use of creative software design tools
- ELA:
  - Reading
  - Writing
  - Researching
  - 2-person presentations

**Depth of Knowledge (Section 5)**

DOK: 3
Curriculum: Computational Thinking

Curricular Unit: Problem Solving

Instructional Unit: C. Apply a variety of problem-solving techniques using an established process to create solutions to scenarios which are situated in a variety of contexts

**Standard Alignments (Section 2)**

<table>
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**Unit (Section 3)**

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<th>Learning Targets:</th>
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- Identify the four steps of the problem solving process
- Apply critical thinking strategies to create and communicate solutions for non-routine problems

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<th>Instructional Strategies:</th>
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</table>

- The teacher will:
  - model:
    - the four-step problem solving process
    - critical thinking strategies versus non-traditional problems
    - proper techniques for individual and group presentations
  - provide:
    - guided practice executing the four-step problem solving process versus non-traditional scenarios
    - whole group instruction on:
      - critical thinking strategies to address non-traditional problems
      - proper communication techniques for individual and group presentations
    - clear feedback to students for improvement
    - opportunities for students to discuss so students can receive formative feedback before summative assessments
    - a clear scoring guide for effective communication techniques for individual and group presentations

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### Assessments/Evaluations:

- **Formative** – students will:
  - list the four steps of the problem-solving process
  - define:
    - linear/binary search
    - selection/quick sort
    - minimal spanning tree
- **Summative**: 2-person team address a community problem utilizing the problem-solving process culminating in a class presentation which highlights a potential solution

### Sample Assessment Questions:

- List advantages/disadvantages of a linear/binary search.
- List advantages/disadvantages of selection/quick sort.
- List the four steps of the problem-solving process.

### Instructional Resources/Tools:

- School issued iPads
- Laptops
- Course curriculum

### Cross Curricular Connections:

- **Math**: Addition/subtraction
- **ELA**:
  - Reading
  - Writing
  - Researching
  - 2-person presentations

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**Depth of Knowledge (Section 5)**

DOK: 3

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Board Approved 8-3-15
Curriculum: Computational Thinking

Curricular Unit: Problem Solving

Instructional Unit: D. **Analyze the connections between mathematics and computer science**

### Standard Alignments (Section 2)

<table>
<thead>
<tr>
<th>VACLE: PP.1.C (HS Lv. 4)</th>
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<tbody>
<tr>
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</tr>
<tr>
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### Unit (Section 3)

**Learning Targets:**

- Define an algorithm and its connection between mathematics and computer science and summarize its behavior
- Create algorithms that meet specific objectives
- Assess if a created algorithm solves a set of given problems
- Identify characteristics of problems which cannot be solved using an algorithm
- Analyze the connections between binary code and computers
- Calculate a combination of 8-bit, 7-bit, 6-bit binary codes and determine their respective value

**Instructional Strategies:**

- The teacher will:
  - provide:
    - whole group:
      - instruction on the definition of an algorithm and its behavior
      - discussion on:
        - linear and binary computer search methods
        - binary code and its advantages as the language used for human to computer interface
        - algorithm attributes in the context of routine versus non-routine problems
    - guided practice on:
      - generating and testing algorithms
      - linear and binary search methods and different computer sorting methods
      - converting binary code to decimal numbers and vice versa
    - clear feedback to students for improvement

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- modeling:
  - creating an algorithm for specific objectives
  - linear and binary search methods and different computer sorting methods

Assessments/Evaluations:

- Formative – students will:
  - define binary code
  - demonstrate how binary code is used by a computer
- Summative: Students will translate from binary to decimal and decimal to binary

Sample Assessment Questions:

- Is binary base 10 or base 2?
- What is an algorithm?
- Differentiate between binary and decimal code.
- Convert 6-bit, 7-bit, and 8-bit binary codes to decimal numbers.

Instructional Resources/Tools:

- School issued iPads
- Laptops
- Course curriculum

Cross Curricular Connections:

- Math:
  - Algorithm development
  - Exponential functions
- ELA:
  - Reading
  - Writing
  - Researching
  - 2-person presentations

**Depth of Knowledge (Section 5)**

| DOK: 3 |
Curriculum: Computational Thinking

Curricular Unit: Introduction to Programming

Instructional Unit: E. **Introduce basic computer programming concepts associated with program design and development**

<table>
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<th>Standard Alignments (Section 2)</th>
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<tr>
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<tr>
<td>Performance: 1.1, 1.4, 2.7, 3.5</td>
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<tr>
<th>Unit (Section 3)</th>
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<tbody>
<tr>
<td>Learning Targets:</td>
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<tr>
<td>• Construct appropriate algorithms to solve a problem</td>
</tr>
<tr>
<td>• Design, code, test, and execute a program that corresponds to a set of specifications</td>
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<td>• Select appropriate programming structures</td>
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<tr>
<td>• Locate and correct errors in a program</td>
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<td>• Critique how a program functions</td>
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<td>• Investigate the correctness of a program</td>
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<tr>
<td>• Create programs with practical, personal, and/or societal intent</td>
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<table>
<thead>
<tr>
<th>Instructional Strategies:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Students will:</td>
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<tr>
<td>• monitor and adjust algorithms in order to solve problems through teacher modeling</td>
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<tr>
<td>• make real-world connections using:</td>
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<tr>
<td>• practical</td>
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<tr>
<td>• personal</td>
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<tr>
<td>• societal</td>
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<tr>
<td>intent to create programs using Scratch</td>
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<tr>
<td>• Small group work:</td>
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<tr>
<td>• designing</td>
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<tr>
<td>• coding</td>
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<tr>
<td>• testing</td>
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<tr>
<td>• executing programs as a formative assessment</td>
</tr>
</tbody>
</table>

Board Approved 8-3-15
- Teachers will deal with student error by locating and correcting errors in a program as it is being designed

**Assessments/Evaluations:**

- Formative – students will:
  - demonstrate Scratch Commands
  - create basic programs based upon a specific set of instructions
- Summative: Students will design a detailed program using DIALOGUE/VARIABLE commands to tell a story or play a game and present coding problems/lessons learned

**Sample Assessment Questions:**

- Define sprite characteristics.
- List the three ways to make a sprite move.
- List all of the dialogue commands: say, speak, broadcast, etc.
- How can you manipulate backgrounds/scenes?
- Demonstrate how to create variables in Scratch.

**Instructional Resources/Tools:**

- School issued iPads
- Laptops
- Course curriculum
- Guided inquiry

**Cross Curricular Connections:**

- Math:
  - Cartesian coordinate system
  - Variable creation – score, time, gravity, etc.
- ELA:
  - Reading
  - Writing
  - Researching
  - 2-person presentations

**Depth of Knowledge (Section 5)**

DOK: 4
Curriculum: Computational Thinking

Curricular Unit: Web Design

Instructional Unit: F. Synthesize knowledge of algorithms and abstraction to create and design web pages and documentation for users and equipment

Standard Alignments (Section 2)

| SSCLE: RIGIT.6.L (World History) |
| VACLE: PP.1.C (Level 4)          |
| Knowledge: (CA) 5 (MA) 6 (SC) 7,8 (SS) 6 |
| CCSS: 9-10.RST.1; 9-10.RST.3; 9-10.RST.4; 9-10.RST.5; 9-10.RST.7; 9-10.SL.1c,d; 9-10.SL.2; 9-10.SL.4; 9-10.SL.5 |
| NETS: 1a,c; 2a; 6a,c,d |
| Performance: 1.1, 1.4, 2.7, 3.5 |

Unit (Section 3)

Learning Targets:

• Create web pages to address specified objectives with a practical, personal, and/or societal purpose

• Identify appropriate techniques while creating web pages

• Analyze abstraction to separate style from content in web page design and development

• Describe the use of a website with appropriate documentation

Instructional Strategies:

• The teacher will provide:
  • whole group instruction:
    • regarding online security issues as a result of designing web pages
    • on the definition and use of basic CSS (Cascading Style Sheets)
    • on the use of links to other websites
  • direct instruction navigating and using a HTML editor to create and design web pages
  • guided practice:
    • using a HTML editor to:
      • modify
      • design
      • create
      • web pages
    • utilizing basic CSS
    • on the addition of hyperlinks to web pages
    • clear feedback to students for improvement
    • a clear scoring guide for website content and design

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Assessments/Evaluations:

- Formative – students will:
  - create a basic personal web-page
  - design a web-page which includes pictures
- Summative: Create a personal web-page which uses HTML/CSS coding to display a unique personal design via a web-page

Sample Assessment Questions:

- List specific HTML editor commands.
- List specific CSS editor commands.
- Display commands required to insert a picture, start a new paragraph, open up a link, etc.

Instructional Resources/Tools:

- World Wide Web – [www.codeacademy.com](http://www.codeacademy.com), [www.w3schools.com](http://www.w3schools.com)
- Personal cell phones
- Laptops
- Course curriculum
- Guided inquiry

Cross Curricular Connections:

- ELA:
  - Reading
  - Writing
  - Researching
  - 2-person presentations

**Depth of Knowledge (Section 5)**

DOK: 4