

Curriculum Map: Discovering Computer Science 7

Cochranton Junior and Senior High School

Business Department

Course Description: CS Explorations 1 is an introductory computer science course based in the Scratch programming language, that empowers students to create authentic artifacts and engage with computer science as a medium for creativity, communication, problem solving, and fun. In this course, students will learn foundational concepts and skills of computer science (CS) and programming and students will explore using computers to solve problems and express themselves. Designed to be engaging and relevant to student life, students build, remix, and share their animations, games, stories, music, and art in an engaging and collaborative environment. Some concepts are reiterated on Apple iPad in the “Puzzles” coding environment.

- Creativity
- Innovation
- Critical Thinking
- Problem Solving
- Communication
- Teamwork
- Collaboration

Standards Recognized through the Course

The state of Pennsylvania has adopted CSTA Standards for computer science.

CSTA Standards:

Algorithms & Programming

Program Development & Creating

3A-AP-139-10 Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.

3A-AP-169-10 Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions.

3A-AP-199-10 Systematically design and develop programs for broad audiences by incorporating feedback from users.

Computational Problems

2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.

3A-AP-179-10 Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.

Testing

2-AP-17 Systematically test and refine programs using a range of test cases.

3A-AP-219-10 Evaluate and refine computational artifacts to make them more usable and accessible.

Collaborating & Communicating

2-AP-15 Seek and incorporate feedback from team members and users to refine a solution that meets user needs.

3A-AP-229-10 Design and develop computational artifacts working in team roles using collaborative tools.

3A-AP-239-10 Document design decisions using text, graphics, presentations, and/or demonstrations in the development of complex programs.

ISTE Standards for Students:

1. Empowered Learner

Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

Students:

- A. articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.
- B. use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.

4. Innovative Designer

Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.

Students:

- A. know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
- B. develop, test and refine prototypes as part of a cyclical design process.
- C. exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

5. Computational Thinker

Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

Students:

- A. break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.

6. Creative Communicator

Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.

Students:

- A. create original works or responsibly repurpose or remix digital resources into new creations.
- B. communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.
- C. publish or present content that customizes the message and medium for their intended audiences.

Unit 1 Title: Getting Started with Computer Science

Suggested time frame: 1 week

Standards Addressed:

• **CSTA Standards:**

- 2-AP-19
- 3A-AP-139-10
- 3A-AP-199-10
- 2-AP-13
- 2-AP-17
- 2-AP-15

• **ISTE Standards for Students:**

- 1. Empowered Learner
- 4. Innovative Designer
- 5. Computational Thinker
- 6. Creative Communicator

Essential Questions:

1. Why does Computer Science Matter?
2. What is a computer program?
3. What is collaboration?
4. What is pair programming?
5. What is a Growth Mindset?

Competency	Vocabulary	Strategy	Resources
<ul style="list-style-type: none">• Identify traditional and non-traditional systems as computers.• Solve Basic coding problems through problem-solving techniques• Explain real-world social, creative, and practical functions of computer science• Practice growth mindset techniques and how to implement them while coding	<ul style="list-style-type: none">• Computer Science• Pair Programming• Growth Mindset• Pair Programming	Class discussions and modeling will be used to introduce new content. New Content is provided through vibrant Slide presentations. Short and effective video clips enforce daily objectives. Unplugged pseudo code activities are used as part of introduction to key terminology.	<ul style="list-style-type: none">• Internet access• Laptop / Thin Client / Desktop• AMAZON’S FUTURE ENGINEER: PROJECT STEM – CS EXPLORATIONS I curriculum Block A – Unit 0• Scratch programming platform• Classroom tools• iPads with Puzzles app

Unit 2 Title: Motion in Scratch (Events)

Suggested time frame: 5 weeks

• **CSTA Standards:**

- 2-AP-11
- 2-AP-19
- 3A-AP-139-10
- 3A-AP-169-10
- 3A-AP-199-10
- 2-AP-13
- 2-AP-17

▪ **ISTE Standards for Students:**

- **Empowered Learner**
- **Innovative Designer**
- **Computational Thinker**
- **Creative Communicator**

Essential Questions:

1. What is the connection between an event and a response?
2. Where is programming be used in our lives?
3. How can we use coordinates (x,y) when communicating with a computer?
4. What does it mean to debug something?
5. What are some debugging strategies?
6. What is a variable?
7. How do broadcasting and receiving blocks work?

Competency	Vocabulary	Strategy	Resources
<ul style="list-style-type: none">• Gain a basic understanding of programming in Scratch• Find and debug problems in code• Collaborate with other• Use Variables in Code to maintain high levels of versatility• Code mouse events to create a more functional and interactive user program	<ul style="list-style-type: none">• Object Oriented Programming• Responses• Sequencing• Initialization	Class discussions and modeling will be used to introduce new content. New Content is provided through vibrant Slide presentations. Short and effective video clips enforce daily objectives. Guided program development is used for new coding concepts. A culminating project reinforces all unit concepts.	<ul style="list-style-type: none">• Internet access• Laptop / Thin Client / Desktop• AMAZON’S FUTURE ENGINEER: PROJECT STEM – CS EXPLORATIONS I curriculum – Block A – Unit 1• Scratch programming platform

Unit 3 Title: Animations and Iteration

Suggested time frame: 2 weeks

• **CSTA Standards:**

- 2-AP-11
- 2-AP-19
- 3A-AP-139-10
- 3A-AP-169-10
- 3A-AP-199-10
- 2-AP-13
- 2-AP-17

▪ **ISTE Standards for Students:**

- **Empowered Learner**
- **Innovative Designer**
- **Computational Thinker**
- **Creative Communicator**

Essential Questions:

1. What are Loops and why do we use them?
2. What's the difference between a vector graphic and a bitmap (raster) graphic?
3. How can we use loops to enhance animation features like costume changes and sounds?
4. What is frame rate and how does it apply to coding and animation?
5. How do loops increase the function of a program?

Competency	Vocabulary	Strategy	Resources
<ul style="list-style-type: none">• Identify the history of animation• Identify and change frame rates in animations• Utilize loops to create more efficient code• Build animations in scratch using different frame rates of their choosing	<ul style="list-style-type: none">• Vector• Bitmap/raster• Graphic• Iteration (loop)	Class discussions and modeling will be used to introduce new content. Use unplugged activities to help understand new concepts. New Content is provided through vibrant Slide presentations. Short and effective video clips enforce daily objectives. Guided program development is used for new coding concepts. A culminating project reinforces all unit concepts.	<ul style="list-style-type: none">• Internet access• Laptop / Thin Client / Desktop• AMAZON'S FUTURE ENGINEER: PROJECT STEM – CS EXPLORATIONS I curriculum• Scratch programming platform

Unit 4 Title:**Games (Conditionals) – A brief introduction to Decision Making through code****Suggested time frame:**

1 week

• CSTA Standards:

- 2-AP-11
- 2-AP-19
- 3A-AP-139-10
- 3A-AP-169-10
- 3A-AP-199-10
- 2-AP-13
- 2-AP-17
- 3A-AP-239-10

▪ ISTE Standards for Students:

- Empowered Learner
- Innovative Designer
- Computational Thinker
- Creative Communicator

Essential Questions:

1. What is a conditional statement?
2. What is pseudocode?
3. How does computer science impact real-world events?

Competency	Vocabulary	Strategy	Resources
<ul style="list-style-type: none">• Build programs in Scratch that use if-then and if-then-else conditional statements• Use pseudocode to plan a programming project• Build programs that use Boolean operators	<ul style="list-style-type: none">• Decision Structure• If/Then• Boolean• Conditional	Class discussions and modeling will be used to introduce new content. Use unplugged activities to help understand new concepts. New Content is provided through vibrant Slide presentations. Short and effective video clips enforce daily objectives. Guided program development is used for new coding concepts.	<ul style="list-style-type: none">• Internet access• Laptop / Thin Client / Desktop• AMAZON'S FUTURE ENGINEER: PROJECT STEM – CS EXPLORATIONS I curriculum• Scratch programming platform