

# Digital Design

# Seventh Grade

**Prepared by:**

Danielle Vandenberghe

*Superintendent of Schools:*

Marie C. Cirasella, Ed.D.

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## **Digital Design 7**

**Course Description:** This course will empower students to productively utilize a variety of digital tools in mini design units. Technology genres will include: digital citizenship, video game design, programming, circuits and robotics.

### **Course Sequence:**

Unit 1: Digital Citizenship and Video Games – 3 Weeks

Unit 2: Circuits and Programming – 3 Weeks

Unit 3: Robotics and Programming – 3 Weeks

**Prerequisite:** None

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**Unit 1 - Overview**

**Content Area:** Computer Science

**Unit Title:** Digital Citizenship & Video Games

**Grade Level:** Seventh

**Core Ideas:** Students will research digital citizenship, select topics, and then build a video game using the Bloxels platform to educate others on an important aspect of digital citizenship.

**Unit 1 - Standards**

**Standards (Content and Technology):**

**CPI#:**

**Statement:**

**Computer Science and Design Thinking**

8.1.8.CS.2

Design a system that combines hardware and software components to process data.

8.1.8.CS.3

Justify design decisions and explain potential system trade-offs.

8.1.8.CS.4

Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems.

8.1.8.IC.1

Compare the trade-offs associated with computing technologies that affect individual's everyday activities and career options.

8.1.8.AP.1

Design and illustrate algorithms that solve complex problems using flowcharts and/or pseudocode.

8.1.8.AP.2

Create clearly named variables that represent different data types and perform operations on their values.

8.1.8.AP.4

Decompose problems and sub-problems into parts to facilitate the design, implementation, and review of programs.

8.1.8.AP.6

Refine a solution that meets users' needs by incorporating feedback from team members and users.

8.1.8,AP.8

Systematically test and refine programs using a range of test cases and users.

8.2.8.ED.2

Identify the steps in the design process that could be used to solve a problem.

8.2.8.ED.6

Analyze how trade-offs can impact the design of a product.

8.2.8.ED.7

Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).

**Career Readiness, Life Literacies, and Key Skills**

9.1.8.CR.2

Compare various ways to give back through strengths, passions, goals, and other personal factors.

9.2.8.CAP.4

Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.

9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
9.4.8.DC.1	Analyze the resource citations in online materials for proper use.
9.4.8.DC.3	Describe tradeoffs between allowing information to be public (e.g., within online games) versus keeping information private and secure.
9.4.8.DC.4	Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences.
9.4.8.DC.5	Manage digital identity and practice positive online behavior to avoid inappropriate forms of self-disclosure.
9.4.8.DC.6	Analyze online information to distinguish whether it is helpful or harmful to reputation.
9.4.8.TL.6	Collaborate to develop and publish work that provides perspectives on a real-world problem.

### **Intercultural Statements (Amistad, Holocaust, LGBT, etc...)**

LGBTQ and Disabilities NJSA 18A:35-4.35	Explore computer scientist in the LGBTQ community, including but not limited to Sofia Kovalevskaya, Alan Turing, Christopher Strachey, Peter Landin, Edith Windsor, Lynn Conway, Jon Hall, Sphie Wilson, Mary Ann Horton, and Audrey Tang
Amistad Law NJSA 18A:35-4.43	Explore African-American computer scientist, including but not limited to Clarence Ellis, Melba Roy Mouton, Katherine Johnson, Mary Jackson, and Annie Easley
Holocaust Law NJSA 18A:35-28	Explore Jewish computer scientist, including but not limited to Joseph Weizenbaum, Larry Page, Hilary Putnam, Jon von Neumann, Sergery Brin, Saul Amarel and Norbert Wiener
AAPI Law NJSA 18A:25-4.44	Explore Asian-American/Pacific Islander computer scientist, including but not limited to Peter Tsaai, Nainoa Thompson, Flossie Wong-Staal, Ajay Bhatt, Min Chueh Chang, Roseli Ocamp-Friedmann, Steven Shih Chen, and Ching Wan Tang

### **Interdisciplinary Connection**

Science: MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
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Math:MP.2	Reason abstractly and quantitatively.
History: 6.1.8.EconN E.4. b	Analyze how technological innovations affected the status and social class of different groups of people and explain the outcomes that resulted.

### **Companion Standards**

WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation
RST.6-8-1	Cite specific textual evidence to support analysis of science and technical texts.

**Social and Emotional Learning**

Self-Awareness	<ul style="list-style-type: none"> <li>• Examining prejudices and biases</li> <li>• Having a growth mindset</li> </ul>
Self Management	<ul style="list-style-type: none"> <li>• Exhibiting self-discipline and self-motivation</li> <li>• Using planning and organizational skills</li> </ul>
Social Awareness	<ul style="list-style-type: none"> <li>• Taking others’ perspectives</li> <li>• Understanding the influences of organizations/systems on behavior</li> </ul>
Relationship Skills	<ul style="list-style-type: none"> <li>• Communicating effectively</li> <li>• Practicing teamwork and collaborative problem-solving</li> <li>• Showing leadership in groups</li> </ul>
Responsible Decision Making	<ul style="list-style-type: none"> <li>• Demonstrating curiosity and open-mindedness</li> <li>• Recognizing how critical thinking skills are useful both inside &amp; outside of school</li> </ul>

<p><b>Unit Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• Why is digital citizenship necessary to use digital media responsibly and ethically?</li> <li>• How can digital media be used to inform or teach? • How can video games be useful/educational? • How can students use design and computational thinking to create meaningful video games?</li> </ul>	<p><b>Unit Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>• Digital citizenship is required in order to use digital media as a responsible and ethical learner.</li> <li>• Digital media can be used to inform/teach • Video games can be used to engage and reach those we want to teach/inform</li> <li>• Game Design and hands-on construction of technological elements can help create innovative and productive prototypes</li> <li>• Effective design requires a willingness to show users unfinished work.</li> <li>• Video games can be used to engage and reach those we want to teach/inform.</li> </ul>
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**Evidence of Learning**

<p><b>Formative Assessments:</b></p> <ul style="list-style-type: none"> <li>- Do Now</li> <li>- Teacher observations</li> <li>- Questioning</li> <li>- Quizzes</li> <li>- Practice Programs</li> <li>- Entry tickets</li> <li>- Exit tickets</li> <li>- Online games</li> <li>- Discussions</li> <li>- Homework</li> </ul>	<p><b>Summative/Benchmark Assessment(s):</b></p> <ul style="list-style-type: none"> <li>- Projects</li> <li>- Tests</li> <li>- Chapter Review / Quizzes</li> <li>- Chapter Assignments</li> <li>- Labs</li> </ul>
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- Final Project

**Alternative Assessments:**

- Portfolio
- Projects
- Online tests / assignments

**Resources/Materials:**

- Interland: digital citizenship game by Google - [https://beinternetawesome.withgoogle.com/en\\_us/interland](https://beinternetawesome.withgoogle.com/en_us/interland) and
- Digital Passport: digital citizenship games by Common Sense Media - <https://www.digitalpassport.org/> • Common Sense Media
- Bloxel EDU App: <https://edu.bloxelsbuilder.com/>
- Bloxels
- Bloxel Videos: <https://www.bloxelsbuilder.com/tutorials>

**Key Vocabulary:**

Password, Private Information, Target, Upstander, Bystander, Cyberbully, Online privacy, Personal Information, Reputation, Digital footprint, Oversharing, Catfishing, Malicious, Phishing, Scam, Smishing, Spearphishing, Credible, Clickbait, Target, Characters, Levels, Board

**Suggested Pacing Guide**

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Digital Citizenship	<ul style="list-style-type: none"> <li>• Learn about important precepts of digital citizenship</li> <li>• Share their learning with their classmates</li> <li>• Teach their classmates using video games as an educational/learning vehicle.</li> </ul>	<ul style="list-style-type: none"> <li>• Students will play Interland (Be Internet Awesome) digital citizenship games by Google               <ul style="list-style-type: none"> <li>○ Mindful Mountain (sharing)</li> <li>○ Tower of Treasure (privacy)</li> <li>○ Kind Kingdom (kindness)</li> <li>○ Reality River (safety)</li> </ul> </li> <li>• Students will play Digital Passport digital citizenship games by Common Sense Media:               <ul style="list-style-type: none"> <li>○ Password Protect (password safety)</li> <li>○ Share Jumper (sharing)</li> <li>○ E-volve (cyberbullying)</li> </ul> </li> <li>• Students will take notes using as they play the games and watch the video</li> <li>• Students will share out something they learned in a discussion</li> <li>• Students will choose a Digital Citizenship topic to focus on for their project.</li> </ul>	3 Days

<p>Digital Citizenship Game Design</p>	<ul style="list-style-type: none"> <li>• Design a video game to teach/inform about one aspect of digital citizenship</li> <li>• Use computational thinking and pre coding concepts to design game layouts and art elements</li> <li>• Experiment with the game design features of art, animation, digital storytelling, and multimedia creation</li> </ul>	<ul style="list-style-type: none"> <li>• Students will watch a Bloxels EDU intro video</li> <li>• Students will play existing games in Bloxels EDU: As students play, they will record pros/cons of the levels</li> <li>• Students will define the goal for their game design</li> </ul>	<p>10 Days</p>
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		<ul style="list-style-type: none"> <li>• Students will ideate their games using storyboard</li> <li>• Students will spend seven classes prototyping their games using boards, blocks, and the Bloxels EDU app <ul style="list-style-type: none"> <li>○ Mini lessons will be interspersed to demonstrate game design features</li> </ul> </li> <li>• Students will test their classmates' games and provide feedback</li> <li>• Students will continue prototyping</li> <li>• Students will publish their games and post their games to a shared space.</li> <li>• Students will vote for the most "successful" game level based on digital citizenship impact, fun factor, and creativity</li> <li>• Students will complete a Digital Citizenship Game Design reflection</li> </ul>	
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**Teacher Notes:** This is based on the Bloxel gaming platform but the lessons could be adapted for other game design courses.

**Additional Resources:**

**Differentiation/Modification Strategies**

<p><b>Students with Disabilities</b></p>	<p><b>English Language Learners</b></p>	<p><b>Gifted and Talented Students</b></p>	<p><b>Students at Risk</b></p>	<p><b>504 Students</b></p>
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<ul style="list-style-type: none"> <li>• Allow errors</li> <li>• Rephrase questions, directions, and explanations</li> <li>• Allow extended time to answer questions and permit drawing as an explanation</li> <li>• Accept participation on any level, even one word</li> <li>• Consult with Case Managers and follow IEP accommodations/modifications</li> </ul>	<ul style="list-style-type: none"> <li>• Assign a buddy, same language or English speaking</li> <li>• Allow errors in speaking</li> <li>• Rephrase questions, directions, and explanations</li> <li>• Allow extended time to answer questions</li> <li>• Accept participation at any level, even one word</li> </ul>	<ul style="list-style-type: none"> <li>• Provide extension activities</li> <li>• Build on students' intrinsic motivation</li> <li>• Consult with parents to accommodate students' interests in completing tasks at their level of engagement</li> </ul>	<ul style="list-style-type: none"> <li>• Provide extended time to complete tasks</li> <li>• Consult with Guidance Counselors and follow I&amp;RS procedures/action plans</li> <li>• Consult with other members of the 7th grade team for specific behavior interventions</li> <li>• Provide rewards as necessary</li> </ul>	<ul style="list-style-type: none"> <li>• Allow errors</li> <li>• Rephrase questions, directions, and explanations</li> <li>• Allow extended time to answer questions and permit drawing as an explanation</li> <li>• Accept participation on any level, even one word</li> <li>• Consult with Case Managers and follow IEP accommodations/modifications</li> <li>• Assign a buddy, same language or English speaking</li> </ul>
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**Unit 2 - Overview**

**Content Area:** Computer Science

**Unit Title:** Circuits and Programming

**Grade Level:** Seventh

**Core Ideas:** Students will experiment with coding and circuits. They will learn the basics of programming while creating mini projects using circuits. At the end of the unit students will create an arcade game that can bring awareness to a community problem.

**Unit 2 - Standards**

**Standards (Content and Technology):**

**CPI#:**

**Statement:**

**Computer Science and Design Thinking**

8.1.8.CS.2

Design a system that combines hardware and software components to process data.

8.1.8.CS.3

Justify design decisions and explain potential system trade-offs.

8.1.8.CS.4

Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems.

8.1.8.IC.1

Compare the trade-offs associated with computing technologies that affect individual's everyday activities and career options.

8.1.8.DA.5	Test, analyze, and refine computational models.
8.1.8.AP.1	Design and illustrate algorithms that solve complex problems using flowcharts and/or pseudocode.
8.1.8.AP.2	Create clearly named variables that represent different data types and perform operations on their values.
8.1.8.AP.3	Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.
8.1.8.AP.4	Decompose problems and sub-problems into parts to facilitate the design, implementation, and review of programs.
8.1.8.AP.6	Refine a solution that meets users' needs by incorporating feedback from team members and users.
8.1.8.AP.8	Systematically test and refine programs using a range of test cases and users.
8.2.8.ED.1	Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
8.2.8.ED.2	Identify the steps in the design process that could be used to solve a problem.
8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
8.2.8.ED.6	Analyze how trade-offs can impact the design of a product.
8.2.8.ED.7	Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).
<b>Career Readiness, Life Literacies, and Key Skills</b>	
9.1.8.CR.2	Compare various ways to give back through strengths, passions, goals, and other personal factors.
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NJSA 18A:35-28	
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RST.6-8-1	Cite specific textual evidence to support analysis of science and technical texts.

**Social and Emotional Learning**

Self-Awareness	<ul style="list-style-type: none"> <li>• Examining prejudices and biases</li> <li>• Having a growth mindset</li> </ul>
Self Management	<ul style="list-style-type: none"> <li>• Exhibiting self-discipline and self-motivation</li> <li>• Using planning and organizational skills</li> </ul>
Social Awareness	<ul style="list-style-type: none"> <li>• Taking others' perspectives</li> <li>• Understanding the influences of organizations/systems on behavior</li> </ul>
Relationship Skills	<ul style="list-style-type: none"> <li>• Communicating effectively</li> <li>• Practicing teamwork and collaborative problem-solving</li> <li>• Showing leadership in groups</li> </ul>
Responsible Decision Making	<ul style="list-style-type: none"> <li>• Demonstrating curiosity and open-mindedness</li> <li>• Recognizing how critical thinking skills are useful both inside &amp; outside of school</li> </ul>

**Unit Essential Question(s):**

- What is code and how does it work in the physical world?
- How do you use the codeBit to control image, sound and motion?
- How do you create animations using loops?
- How would you use logic to add rules and choices to your game?
- How do variables help you save time when coding games?
- How and why are functions helpful in your code?

**Unit Enduring Understandings:**

- Use code and circuits to create and design
- Understand the basics of coding
- Understand how variables work in Computer Science

**Evidence of Learning****Formative Assessments:**

- Do Now
- Teacher observations
- Questioning
- Quizzes
- Practice Programs
- Entry tickets
- Exit tickets
- Online games
- Discussions
- Homework

**Summative/Benchmark Assessment(s):**

- Projects

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- Tests
- Chapter Review / Quizzes
- Chapter Assignments
- Labs
- Final Project

**Alternative Assessments:**

- Portfolio
- Projects
- Online tests / assignments

**Resources/Materials:**

- Little Bits Classroom:  
<https://classroom.littlebits.com/curriculum/code-kit-core>
- Coding Kits
- Circuits

**Key Vocabulary:**

Circuit, Power, Input, Output, Wire, Magnets, Software, Hardware, Code, Program, Bit, Block, codeBit, Serial mode, Hertz, Tone, Frequency, Pitch, While Loop, For Loop, Animation frame, Variable, Coordinates, Logic, If/Do/Else, And/Or, Round, Signal, Game sprite, Functions, Sequence

**Suggested Pacing Guide**

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Introduction: Hello World	<ul style="list-style-type: none"> <li>• Students will be able to create circuits with littleBits.</li> <li>• Students will be able to create and modify code with the Code Kit app and load it onto their codeBits.</li> <li>• Students will be able to analyze and evaluate strengths and weaknesses of a basic instruction set.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction: Circle up for a group activity “Program the Robot Teacher” to introduce the concept of code as a collection of instructions.</li> <li>• Create: Students will get hands on with Bits to discover how they work, then will learn about how the codeBit brings code to their inventions.</li> <li>• Play: After building their Hello World circuit, each group will use the Hello World activity in the littleBits Code Kit App to learn how to create and load code onto their Bits.</li> <li>• Remix: Time permitting, groups will have a few minutes to openly explore the coding blocks and see what else they can get their circuit to do.</li> <li>• Share: Each group will share the images they created and sent to the LED matrix Bit.</li> </ul>	1 Day
Inputs and Outputs	<ul style="list-style-type: none"> <li>• Students will be able to control images, sound and motion.</li> <li>• Students will make a simple controller. They will learn how to use any input Bit in their kit to control an image on the LED matrix.</li> <li>• Students will make a sound effect. They will learn how to control sound</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction: As a group, watch the inputs and outputs code tutorial video on the Code Kit App.</li> <li>• Tutorials/Create: Students head to the code tutorials in the Code Kit App, and start completing the tutorials in the inputs &amp; outputs category, in this order:</li> </ul>	1 Day

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	using the pressure sensor and the speaker Bit	<ul style="list-style-type: none"> <li>○ Your Very First Game Controller</li> <li>○ 1.1 Arcade Sound Effects</li> </ul> <ul style="list-style-type: none"> <li>• Share – What did you learn? What do you need help with?</li> </ul>	
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Loops	<ul style="list-style-type: none"> <li>• Students will complete the loops code tutorials in the Code Kit app to learn how to use loops to create animations • Students will make a simple animation. They will learn how to use a repeat loop and a forever loop, draw a character on the matrix screen, then add frames to animate it.</li> <li>• Students will make a secret message appear when they press a button. They will learn how to use a repeat while and repeat until loop to hide a scrolling message.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction: As a group, watch the loops code tutorial video in the Fusebox app.</li> <li>• Tutorials/Create: Students head to the code tutorials in the Code Kit App, and start completing the tutorials in the loops category, in this order: <ul style="list-style-type: none"> <li>○ 2.0 Animate Your Own Game Character</li> <li>○ 2.1 Shh! It's A Secret Message</li> </ul> </li> <li>• Share: Ask students to complete the Loops section of their Code Master Workbook.</li> </ul>	1 Day
Logic	<ul style="list-style-type: none"> <li>• Students will complete the logic code tutorials in the Code Kit App learn how to use conditional statements like [IF/DO] and [IF/DO/ELSE] to program rules and choices into their games.</li> <li>• Students will make a multiple choice game using emojis. They will learn how to draw emojis, use IF/DO statements with a single input, as well as use math to add multiple choices to a game.</li> <li>• Students will make a lock combination that retrieves a sword. They will learn how to use multiple input Bits, the IF/DO/ELSE as well as the AND/OR conditional statements to create different lock combinations</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction: As a group, watch the logic code tutorial video in the Code Kit App</li> <li>• Tutorials/Create: Students head to the code tutorials in the Code Kit App, and start completing the tutorials in the logic category in this order: <ul style="list-style-type: none"> <li>○ 3.0 Choose Your Own Emoji</li> <li>○ 3.1 Retrieve The Mystical Sword</li> </ul> </li> <li>• Share: Ask students to complete the logic section of their Code Master Workbook.</li> </ul>	1 Day
Variables	<ul style="list-style-type: none"> <li>• Students will complete the variable code tutorials in the Code Kit App. They will learn how to create and use a time, image, and coordinate variable to add classic features to their games like countdowns, sprites, and extra players.</li> <li>• Students will make a countdown using a birthday melody. They will learn how to create a number variable to control how fast each note in the birthday song plays.</li> <li>• Students will make a game sprite that jumps and makes a sound effect when</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction: Watch the variables code tutorial video in the Code Kit App as a group.</li> <li>• Tutorials/Create: Students head to the code tutorials in the Code Kit App, and start completing the tutorials in the Variables category in this order: <ul style="list-style-type: none"> <li>○ 4.0 Birthday Countdown</li> <li>○ 4.1 Jumpy Monster Sprite</li> </ul> </li> </ul>	1 Day

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	<p>a button is pressed. They will learn how to create and use an image variable to create an animated character sprite.</p>	<ul style="list-style-type: none"> <li>• Share: Ask students to complete the variables section of their Code Master Workbook.</li> </ul>	
<p>Functions</p>	<ul style="list-style-type: none"> <li>• Students will complete the functions code tutorial in the Code Kit App to learn how to create their own unique code block with functions and level up their games.</li> <li>• Students will make a character dance using multiple animations. They will learn how to create functions for each of the custom moves, then reuse them multiple times to create the final animation</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction: Watch the functions code tutorial video in the Code Kit App as a group. <ul style="list-style-type: none"> <li>• Tutorials/Create: Students complete the functions tutorial: <ul style="list-style-type: none"> <li>○ 5.0 Epic Dance Moves</li> </ul> </li> </ul> </li> <li>• Share: Ask students to complete the variables section of their Code Master Workbook</li> </ul>	<p>1 Day</p>
<p>Mini Projects</p>	<ul style="list-style-type: none"> <li>• Students will complete 1-3 mini projects using what they learned throughout this unit</li> </ul>	<ul style="list-style-type: none"> <li>• Mini Projects include: <ul style="list-style-type: none"> <li>○ Hot Potato...of Doom!</li> <li>○ Rockstar Quitar</li> <li>○ Tug of War</li> </ul> </li> <li>• Students will follow the following: <ul style="list-style-type: none"> <li>○ Intro: Review topics</li> <li>○ Create: Build the invention</li> <li>○ Play: Test their coded invention</li> <li>○ Remix: Customize</li> <li>○ Share: Share what they did and learn.</li> </ul> </li> </ul>	<p>2 Days</p>

Main Project	<ul style="list-style-type: none"> <li>• Research a real-world issue that is impacting the local community or someone in the community</li> <li>• Use information and data sources to inform the design of a game/ or smart clothing that addresses an issue.</li> <li>• Design a prototype of a solution to address a local issue, incorporating coding and the littleBits Invention Cycle.</li> <li>• Make sense of problems and persevere in solving them.</li> <li>• Construct viable arguments and critique the reasoning of others.</li> <li>• Use constructive feedback to iterate on a design.</li> <li>• Present research findings and game prototypes/ smart clothing prototypes.</li> </ul>	<ul style="list-style-type: none"> <li>• Students will have a choice of creating a game or a piece of smart clothing.</li> <li>• Design a piece of smart clothing that meets the needs of a user. • Students design a game that will help make life easier for people in their community. At the end, each group will present their prototypes at a "Change the World Arcade"</li> </ul>	1 Week
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**Teacher Notes:** If coding kits are not available lessons could be adapted for other programmable circuits.

**Additional Resources:**

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<b>Differentiation/Modification Strategies</b>				
<b>Students with Disabilities</b>	<b>English Language Learners</b>	<b>Gifted and Talented Students</b>	<b>Students at Risk</b>	<b>504 Students</b>
<ul style="list-style-type: none"> <li>• Allow errors</li> <li>• Rephrase questions, directions, and explanations</li> <li>• Allow extended time to answer questions and permit drawing as an explanation</li> <li>• Accept participation on any level, even one word</li> <li>• Consult with Case Managers and follow IEP accommodations/</li> </ul>	<ul style="list-style-type: none"> <li>• Assign a buddy, same language or English speaking</li> <li>• Allow errors in speaking</li> <li>• Rephrase questions, directions, and explanations</li> <li>• Allow extended time to answer questions</li> <li>• Accept participation at any level, even one word</li> </ul>	<ul style="list-style-type: none"> <li>• Provide extension activities</li> <li>• Build on students' intrinsic motivation</li> <li>• Consult with parents to accommodate students' interests in completing tasks at their level of engagement</li> </ul>	<ul style="list-style-type: none"> <li>• Provide extended time to complete tasks</li> <li>• Consult with Guidance Counselors and follow I&amp;RS procedures/action plans</li> <li>• Consult with other members of the 7th grade team for specific behavior interventions</li> <li>• Provide rewards as necessary</li> </ul>	<ul style="list-style-type: none"> <li>• Allow errors</li> <li>• Rephrase questions, directions, and explanations</li> <li>• Allow extended time to answer questions and permit drawing as an explanation</li> <li>• Accept participation on any level, even one word</li> <li>• Consult with Case Managers and follow IEP accommodations/</li> </ul>

modifications				modifications • Assign a buddy, same language or English speaking
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**Unit 3 - Overview**

**Content Area:** Computer Science

**Unit Title:** Robotics and Programming

**Grade Level:** Seventh

**Core Ideas:** In this unit students will continue to look at programming but with robotics.

**Unit 3- Standards**

**Standards (Content and Technology):**

**CPI#:**

**Statement:**

**Computer Science and Design Thinking**

8.1.8.CS.4

Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems.

8.1.8.DA.5

Test, analyze, and refine computational models.

8.1.8.AP.1

Design and illustrate algorithms that solve complex problems using flowcharts and/or pseudocode.

8.1.8.AP.2

Create clearly named variables that represent different data types and perform operations on their values.

8.1.8.AP.3

Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.

8.1.8.AP.4

Decompose problems and sub-problems into parts to facilitate the design, implementation, and review of programs.

8.1.8.AP.6

Refine a solution that meets users' needs by incorporating feedback from team members and users.

8.1.8.AP.8

Systematically test and refine programs using a range of test cases and users.

8.2.8.ED.1

Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.

8.2.8.ED.2

Identify the steps in the design process that could be used to solve a problem.

8.2.8.ED.6

Analyze how trade-offs can impact the design of a product.

**Career Readiness, Life Literacies, and Key Skills**

9.1.8.CR.2

Compare various ways to give back through strengths, passions, goals, and other personal factors.

9.2.8.CAP.4

Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.

9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
9.4.8.DC.1	Analyze the resource citations in online materials for proper use.
9.4.8.DC.3	Describe tradeoffs between allowing information to be public (e.g., within online games) versus keeping information private and secure.
9.4.8.DC.4	Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences.
9.4.8.DC.5	Manage digital identity and practice positive online behavior to avoid inappropriate forms of self disclosure.
9.4.8.DC.6	Analyze online information to distinguish whether it is helpful or harmful to reputation.
9.4.8.TL.6	Collaborate to develop and publish work that provides perspectives on a real-world problem.
<b>Intercultural Statements (Amistad, Holocaust, LGBT, etc...)</b>	
LGBTQ and Disabilities NJSA 18A:35-4.35	Explore computer scientist in the LGBTQ community, including but not limited to Sofia Kovalevskaya, Alan Turing, Christopher Strachey, Peter Landin, Edith Windsor, Lynn Conway, Jon Hall, Sphe Wilson, Mary Ann Horton, and Audrey Tang
Amistad Law NJSA 18A:35-4.43	Explore African-American computer scientist, including but not limited to Clarence Ellis, Melba Roy Mouton, Katherine Johnson, Mary Jackson, and Annie Easley
Holocaust Law NJSA 18A:35-28	Explore Jewish computer scientist, including but not limited to Joseph Weizenbaum, Larry Page, Hilary Putnam, Jon von Neumann, Sergery Brin, Saul Amarel and Norbert Wiener
AAPI Law NJSA 18A:25-4.44	Explore Asian-American/Pacific Islander computer scientist, including but not limited to Peter Tsaai, Nainoa Thompson, Flossie Wong-Staal, Ajay Bhatt, Min Chueh Chang, Roseli Ocamp-Friedmann, Steven Shih Chen, and Ching Wan Tang
<b>Interdisciplinary Connection</b>	
Science: MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

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Math:MP.2	Reason abstractly and quantitatively.
History: 6.1.8.EconN E.4. b	Analyze how technological innovations affected the status and social class of different groups of people and explain the outcomes that resulted.
<b>Companion Standards</b>	
WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation

RST.6-8-1	Cite specific textual evidence to support analysis of science and technical texts.
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**Social and Emotional Learning**

Self-Awareness	<ul style="list-style-type: none"> <li>• Examining prejudices and biases</li> <li>• Having a growth mindset</li> </ul>
Self Management	<ul style="list-style-type: none"> <li>• Exhibiting self-discipline and self-motivation</li> <li>• Using planning and organizational skills</li> </ul>
Social Awareness	<ul style="list-style-type: none"> <li>• Taking others' perspectives</li> <li>• Understanding the influences of organizations/systems on behavior</li> </ul>
Relationship Skills	<ul style="list-style-type: none"> <li>• Communicating effectively</li> <li>• Practicing teamwork and collaborative problem-solving</li> <li>• Showing leadership in groups</li> </ul>
Responsible Decision Making	<ul style="list-style-type: none"> <li>• Demonstrating curiosity and open-mindedness</li> <li>• Recognizing how critical thinking skills are useful both inside &amp; outside of school</li> </ul>

<p><b>Unit Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• What is code and how does it work in the physical world?</li> <li>• How do you create programs using robots?</li> <li>• How would you use logic to add rules and choices to your programs?</li> <li>• How do variables help you save time when coding? • How and why are functions helpful in your code?</li> </ul>	<p><b>Unit Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>• Use code to create programs for Robots</li> <li>• Understand the basics of coding</li> <li>• Further understand how variables and functions work in Computer Science</li> </ul>
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**Evidence of Learning**

<p><b>Formative Assessments:</b></p> <ul style="list-style-type: none"> <li>- Do Now</li> <li>- Teacher observations</li> <li>- Questioning</li> <li>- Quizzes</li> <li>- Practice Programs</li> <li>- Entry tickets</li> <li>- Exit tickets</li> <li>- Online games</li> <li>- Discussions</li> <li>- Homework</li> </ul> <p><b>Summative/Benchmark Assessment(s):</b></p> <ul style="list-style-type: none"> <li>- Projects</li> <li>- Tests</li> <li>- Chapter Review / Quizzes</li> <li>- Chapter Assignments</li> <li>- Labs</li> <li>- Final Project</li> </ul> <p><b>Alternative Assessments:</b></p> <ul style="list-style-type: none"> <li>- Portfolio</li> <li>- Projects</li> </ul>
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- Online tests / assignments

**Resources/Materials:**

**Key Vocabulary:**

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• Wonder Workshop -  
[https://portal.makewonder.com/#/curriculum/applied\\_robotics/b3e15738-b93a-4740-b82a-fe2e64f02cd7](https://portal.makewonder.com/#/curriculum/applied_robotics/b3e15738-b93a-4740-b82a-fe2e64f02cd7) •  
 Cue Robots

Code, Program. While Loop, For Loop, Variable, Logic, If/Do/Else, And/Or, Functions, Buttons, Commands, Robotics

**Suggested Pacing Guide**

Lesson Name/Topic	Student Learning Objective(s)	Suggested Tasks/Activities:	Day(s) to Complete
Review, Understand and Brainstorm	<ul style="list-style-type: none"> <li>• Understand the Design Thinking Process.</li> <li>• Review prior skills and knowledge</li> <li>• Self-identify as an audience member and use that understanding to empathize with other potential players.</li> </ul>	<ul style="list-style-type: none"> <li>• Review – Review Programming concepts needed for this unit</li> <li>• Direct Instruction – Explain what students will be doing in this unit and have a discussion on the design process.</li> <li>• Guided Practice – Show different parts of the Robot and what they do</li> <li>• Independent Practice – Have students complete activities to learn what the robot does</li> <li>• Wrap up – Pick a few students to show their program and ask exit questions.</li> </ul>	2 Days
Variables and Functions	<ul style="list-style-type: none"> <li>• Learn the basics about <b>functions</b> and <b>variables</b>.</li> </ul>	<ul style="list-style-type: none"> <li>• Review – Review Programming concepts needed for this unit</li> <li>• Direct Instruction – Explain what students will be doing in this unit and have a discussion on functions and variables.</li> <li>• Guided Practice – Demonstrate what students need to do</li> <li>• Independent Practice – Have students complete programs independently</li> <li>• Wrap up – Pick a few students to show their program and ask exit questions.</li> </ul>	1Day

Reusable Functions	<ul style="list-style-type: none"> <li>• Be introduced to <b>reusable functions</b>.</li> <li>• Learn to create reusable functions</li> </ul>	<ul style="list-style-type: none"> <li>• Review – Review Programming concepts needed for this unit</li> <li>• Direct Instruction – Explain what students will be doing in this unit and have a discussion on reusable functions</li> <li>• Guided Practice – Demonstrate what students need to do</li> <li>• Independent Practice – Have students complete programs independently</li> <li>• Wrap up – Pick a few students to show their program and ask exit questions.</li> </ul>	1Day
Functions and Variables with Buttons	<ul style="list-style-type: none"> <li>• Review the sensory inputs available on the robot.</li> <li>• Learn how to manipulate data</li> </ul>	<ul style="list-style-type: none"> <li>• Review – Review Programming concepts needed for this unit</li> <li>• Direct Instruction – Explain what students will be doing in</li> </ul>	1Day

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		<p>this unit and have a discussion on functions and variables with buttons</p> <ul style="list-style-type: none"> <li>• Guided Practice – Demonstrate what students need to do</li> <li>• Independent Practice – Have students complete programs independently</li> <li>• Wrap up – Pick a few students to show their program and ask exit questions.</li> </ul>	
Conditionals	<ul style="list-style-type: none"> <li>• Review <b>functions</b> and <b>variables</b>. • Learn about <b>conditionals</b> and practice using them with <b>variables</b> and <b>events</b> in a guided activity.</li> </ul>	<ul style="list-style-type: none"> <li>• Review – Review Programming concepts needed for this unit</li> <li>• Direct Instruction – Explain what students will be doing in this unit and have a discussion on conditionals</li> <li>• Guided Practice – Demonstrate what students need to do</li> <li>• Independent Practice – Have students complete programs independently</li> <li>• Wrap up – Pick a few students to show their program and ask</li> </ul>	1Day

		exit questions.	
Using Conditionals	<ul style="list-style-type: none"> <li>• Review <b>conditionals</b>.</li> <li>• Learn some specific uses for conditionals in games.</li> </ul>	<ul style="list-style-type: none"> <li>• Review – Review Programming concepts needed for this unit</li> <li>• Direct Instruction – Explain what students will be doing in this unit and have a discussion using conditionals</li> <li>• Guided Practice – Demonstrate what students need to do</li> <li>• Independent Practice – Have students complete programs independently</li> <li>• Wrap up – Pick a few students to show their program and ask exit questions.</li> </ul>	1Day
Project	<ul style="list-style-type: none"> <li>• Make relevant changes to the rules in their projects.</li> <li>• Learn to utilize snippets of code developed</li> <li>• Discuss the purpose of sharing and refining their projects with others.</li> </ul>	<ul style="list-style-type: none"> <li>• Students will complete their projects</li> <li>• Students will share their projects with classmates to get feedback</li> <li>• Test and Revise</li> <li>• Share and Present</li> </ul>	5 Days

**Teacher Notes:** If Cue Robotics are not available adjust the curriculum for another programmable robot.

**Additional Resources:**

**Differentiation/Modification Strategies**

<b>Students with Disabilities</b>	<b>English Language Learners</b>	<b>Gifted and Talented Students</b>	<b>Students at Risk</b>	<b>504 Students</b>
<ul style="list-style-type: none"> <li>• Allow errors</li> </ul>	<ul style="list-style-type: none"> <li>• Assign a buddy, same language or English speaking</li> </ul>	<ul style="list-style-type: none"> <li>• Provide extension activities</li> </ul>	<ul style="list-style-type: none"> <li>• Provide extended time to complete tasks</li> </ul>	<ul style="list-style-type: none"> <li>• Allow errors</li> </ul>

<ul style="list-style-type: none"> <li>• Rephrase questions, directions, and explanations</li> <li>• Allow extended time to answer questions and permit drawing as an explanation</li> <li>• Accept participation on any level, even one word</li> <li>• Consult with Case Managers and follow IEP accommodations/modifications</li> </ul>	<ul style="list-style-type: none"> <li>• Allow errors in speaking</li> <li>• Rephrase questions, directions, and explanations</li> <li>• Allow extended time to answer questions</li> <li>• Accept participation at any level, even one word</li> </ul>	<ul style="list-style-type: none"> <li>• Build on students' intrinsic motivation</li> <li>• Consult with parents to accommodate students' interests in completing tasks at their level of engagement</li> </ul>	<ul style="list-style-type: none"> <li>• Consult with Guidance Counselors and follow I&amp;RS procedures/action plans</li> <li>• Consult with other members of the 7th grade team for specific behavior interventions</li> <li>• Provide rewards as necessary</li> </ul>	<ul style="list-style-type: none"> <li>• Rephrase questions, directions, and explanations</li> <li>• Allow extended time to answer questions and permit drawing as an explanation</li> <li>• Accept participation on any level, even one word</li> <li>• Consult with Case Managers and follow IEP accommodations/modifications</li> <li>• Assign a buddy, same language or English speaking</li> </ul>
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