Madison Public Schools
STEAM Kindergarten Curriculum

Written by:
Michelle D'Amico

Reviewed by:
Daniel J. Ross, Esq.
Director of Curriculum and Instruction

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Members of the Board of Education:
Leslie Lajewski, President
Lisa Ellis, Vice President
Johanna Habib
David Irwin
Thomas Piskula
Heather Reddy
Abi Singh
Pam Yousey

Madison Public Schools
359 Woodland Road
Madison, NJ 07940
www.madisonpublicschools.org

Course Overview

Description

The goal of STEAM is to integrate science, technology, engineering, art, and math. These cross-curricular units are designed to build on what students have learned or will learn in their science, math, language arts, and technology courses. Students are given a series of tasks to complete throughout each unit, which culminates with a final project.

Goals

This course is separated into two units.

Unit 1 aims to:
- Develop engineering and design principles
- Develop research skills and analyze information
- Make observations and collect data
- Develop a simple schematic drawing
- Create a model
- Develop their use of technology
- Present information to an audience
- Support the Kindergarten science, math, language arts, and technology curriculum

Along with the goals of Unit 1, Unit 2 aims to:
- Develop and reinforce computer science curriculum
- Develop and reinforce problem solving skills
- Develop and reinforce collaboration with others
- Introduce internet safety
- Develop a coded game or story
- Develop their use of technology
- Present information to an audience
- Support Kindergarten technology curriculum

Resources

NJ Technology Standards https://www.state.nj.us/education/cccs/2014/tech/8.pdf
NGSS http://ngss.nsta.org/AccessStandardsByTopic.aspx
Madison Public Schools Kindergarten Curriculum
Computer Science Standards https://curriculum.code.org/csf-18/standards/

Modifications and Adaptations for Special Needs Learners
(Gifted and Talented Students, English Language Learners, Special Education Students, At-Risk Students)

Unit 1 Overview

Unit Title: UV Radiation

Unit Summary:
In this unit, students will develop a greater understanding on the effects of sunlight on Earth's surface. Students will gain an understanding that the sun, and its rays, can affect us in our daily lives. Students will learn about the dangers of UV Radiation and how we protect ourselves from these rays. The final project will include students building a model of a structure that can cover a playground and protect students from UV Radiation.

Suggested Pacing: 15 lessons

Learning Targets

Unit Essential Questions:
- What is UV Radiation and where does it come from?
- Is UV Radiation dangerous? If so, how do we protect ourselves from it?
- What is the engineering design process?

Unit Enduring Understandings:
- UV Radiation comes from the sun and can be dangerous to humans.
- The engineering design process is a process we use to create things and has multiple steps.

Evidence of Learning

Unit Benchmark Assessment Information: There are a variety of ways students will demonstrate their learning: research, discussions, performance tasks, design challenges and reflections.

Objectives (Students will be able to...)	Essential Content/Skills	Suggested Assessments	Standards	Pacing
Be introduced to the engineering design process.	Simple building tasks using the engineering design process to solve a common problem (ex. Building a tower to a certain height, or a bridge to a certain length). A second activity could be to design a slide to determine how the strength of a push or pull will make things speed up or slow down more quickly. Walk students through two building tasks.	Have students cut and paste the steps of the engineering design process in the correct place, with a partner.	**Science and Engineering Practices and Disciplinary Core Ideas** Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2) A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (K-2-ETS1-1) Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)	Week 1-2

	Explain each step of the engineering design process throughout the activities.		Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3) Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2)	
Identify UV Rays	Students will identify that the sun emits UV Radiation. Students can use teacher approved videos and websites.	Students should complete a mini book on UV Radiation.	**NGSS** K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2) **Common Core ELA/Literacy** W.2.8 - Recall information from experiences or gather information from provided sources to answer a question. **Technology** 8.1.2.E.1 Use digital tools and online resources to explore a problem or issue.	Week 3
Identify the dangers of UV Radiation	Students will be able to identify the dangers of UV Radiation and understand that we use clothing, hats, and sunscreen to protect our bodies. Students can use teacher approved videos and websites.	Students can create a paper hat, shirt, or sunscreen bottle to reinforce the idea that UV Radiation is dangerous and we must protect ourselves from it.	**NGSS** K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2) **Common Core ELA/Literacy** W.2.8 - Recall information from experiences or gather information from provided sources to answer a question. **Technology** 8.1.2.E.1 Use digital tools and online resources to explore a problem or issue.	Week 4-5
Identify the dangers of UV Radiation	Create sunsense bracelets using color changing beads. Students can take these bracelets outside to see how the color changes when exposed to UV Radiation.	Students should draw a picture of their bracelets in the sun and out of the sun to compare.	**NGSS** K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)	Week 6-7

			Common Core ELA/Literacy W.2.8 - Recall information from experiences or gather information from provided sources to answer a question. **Science and Engineering Practices and Disciplinary Core Ideas** Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3) Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2) Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) Ask questions based on observations to find more information about the designed world. (K-ESS3-2)	
Plan and execute a simple experiment	Test their bracelets while being covered with different materials to compare what happens.	Students should complete a simple sheet in which they draw a picture of their bracelets in the sun and then covered with a material to compare.	**NGSS** K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. **Common Core ELA/Literacy** W.2.8 - Recall information from experiences or gather information from provided sources to answer a question. **Science and Engineering Practices and Disciplinary Core Ideas** Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3) Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2)	Week 8-9

| | | | Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1)

Ask questions based on observations to find more information about the designed world. (K-ESS3-2)

Math
Measurement and Data K.MD | |
|---|---|---|---|---|
| Create a map | Students will create a map of the school playground. Teacher should discuss different components and symbols on a map. Students can also use google earth to explore. | Reading a map worksheet. | **Technology**
8.1.2.F.1 Use geographic mapping tools to plan and solve problems

Math
Measurement and Data K.MD | Week 10-11 |
| Create a schematic drawing | Students will create a simple schematic drawing of their design to build something to cover the playground to protect from UV Radiation. | | **Science and Engineering Practices and Disciplinary Core Ideas**

Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2)

Technology
8.2.2.A.4 Choose a product to make and plan the tools and materials needed.

8.2.2.A.5 Collaborate to design a solution to a problem affecting the community

8.2.2.C.1 Brainstorm ideas on how to solve a problem or build a product.

8.2.5.C.1 Collaborate with peers to illustrate components of a designed system.

8.1.2.A.2 Create a document using a word processing application.

Math
Measurement and Data K.MD
Geometry K.G | Week 12 |
| Develop a simple model | Students in groups will create their model and test it outside. However, students should use the engineering design process to fix their design. | Reflection sheet | **Science and Engineering Practices and Disciplinary Core Ideas**

Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2) | Week 13-15 |

| | | | **Technology** 8.2.2.A.4 Choose a product to make and plan the tools and materials needed.

8.2.2.A.5 Collaborate to design a solution to a problem affecting the community

8.2.2.C.1 Brainstorm ideas on how to solve a problem or build a product.

8.2.5.C.1 Collaborate with peers to illustrate components of a designed system.

8.1.2.A.2 Create a document using a word processing application.

Math Measurement and Data K.MD Geometry K.G | |

Unit 2 Overview

Unit Title: Introduction to Computer Science

Unit Summary:
This unit provides an introduction of computer science and coding using code.org curriculum. Students will be introduced to what coding is, how we code, internet safety, and creating their own coded game or story. This unit will also contain journaling at the end of each lesson in which students can write or draw what they learned and how it made them feel.

Students will learn to program using using commands like loops and events. The lessons featured in this course also teach students to collaborate with others meaningfully, investigate different problem-solving techniques, persist in the face of difficult tasks, and learn about internet safety. By the end of this unit, students create their very own custom game or story from Play Lab that they can share.

*This unit should not be used with the Kindergarten class until the 2019-2020 school year.

Suggested Pacing: About 18 Weeks

Learning Targets

Unit Essential Questions:
- What is coding?
- Why do we use coding?
- Who uses coding?
- How do we code?
- How do we problem solve?
- How can we be safe on the internet?
- How can we code a game or story?

Unit Enduring Understandings:
- Sequencing
- Loops
- Events
- Digital Citizenship
- I can solve problems if I keep trying

Evidence of Learning

Unit Benchmark Assessment Information: Students can work at their own pace through most of the units. Struggling students can repeat units. At the end of the unit, students will have to design a game or story using coding.

Objectives (Students will be able to...)	Essential Content/Skills	Suggested Assessments	Standards	Pacing
Students will be able to understand what is coding, why do we use coding, and who uses coding.	**Class 1** Teacher will play a game with the students in which every student must follow a specific set of instructions from the teacher. The teacher will introduce coding as a set of directions for the computer. Students will watch the following video on coding: https://jr.brainpop.com/artsandtechnology/technology/computerprogramming/ Teacher will ask students what they think coding is and who uses it? **Class 2** Students will complete a simple maze in which they have to identify with their group the steps they would need to take to get from the start to the finish. Introduce students to code.org	Each group will share out how the maze is like coding.	**K-12 Computer Science Standards** AP - Algorithms & Programming 1A-AP-11 - Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions **Speaking & Listening** K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. **Math Practices** MP.1 - Make sense of problems and persevere in solving them MP.2 - Reason abstractly and quantitatively	Weeks 1-2
Students will be able to: -Express that they have noticed when something goes differently than what is expected. -Identify what the expected result was before an error occurs. -Determine and describe the difference between what was expected and what actually happened in the event of an error. -Debug a program.	Lesson 1: Unspotted Bugs https://curriculum.code.org/csf-18/coursea/1/	Students will complete the unit and journal in their notebook about what they learned (may include drawings).	**K-12 Computer Science Standards** AP - Algorithms & Programming 1A-AP-11 - Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions **Common Core English Language Arts Standards** K.RL.7 - With prompting and support, describe the relationship between illustrations and the story in which they appear (e.g., what moment in a story an illustration depicts). **Speaking & Listening** K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with	Week 3

			peers and adults in small and larger groups. **Common Core Math Standards** K.G.5 - Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes. MP.1 - Make sense of problems and persevere in solving them MP.2 - Reason abstractly and quantitatively	
Students will be able to: -Identify and point out symptoms of frustration. -Illustrate at least one reason why they will choose to be persistent in the face of frustration, rather than giving up. -Create a working maze	Lesson 2: Stevie and the Big Project https://curriculum.code.org/csf-18/coursea/2/	Journaling	**K-12 Computer Science Standards** AP - Algorithms & Programming 1A-AP-11 - Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions **Common Core English Language Arts Standards** K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. **Common Core Math Standards:** MP.1 - Make sense of problems and persevere in solving them **Next Generation Science Standards** ETS1 - Engineering Design	Weeks 4-5
Students will be able to: -Decompose large activities into a series of smaller activities. -Arrange sequential events into their logical order	Lesson 3: Plant a Seed https://curriculum.code.org/csf-18/coursea/3/	Students will complete a worksheet with real life algorithms to complete.	**K-12 Computer Science Standards** 1A-AP-08 - Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. 1A-AP-09 - Model the way programs store and manipulate data by using numbers or other symbols to represent information. 1A-AP-11 - Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions **Common Core English Language Arts Standards** K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. **Common Core Math Standards** MP.1 - Make sense of problems and persevere in solving them	Week 6

			K.G.1 - Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	
Students will be able to: -Take an algorithm and turn it into a program -Decode a program that was created by someone else -Run a program -Debug a program	Lesson 5: Happy Maps https://curriculum.code.org/csf-18/coursea/5/	Journaling and completed lesson on the computer	**K-12 Computer Science Standards** 1A-AP-09 - Model the way programs store and manipulate data by using numbers or other symbols to represent information. 1A-AP-11 - Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions **Common Core English Language Arts Standards** K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. **Common Core Math Standards** MP.1 - Make sense of problems and persevere in solving them K.G.1 - Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	Week 7
Students will be able to: -Create a set of commands based on movements	Lesson 6: Programming with Angry birds https://curriculum.code.org/csf-18/coursea/6/	Journaling and completed lesson on the computer	**K-12 Computer Science Standards** 1A-AP-08 - Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. 1A-AP-09 - Model the way programs store and manipulate data by using numbers or other symbols to represent information. 1A-AP-11 - Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions **Common Core English Language Arts Standards** K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. **Common Core Math Standards** MP.1 - Make sense of problems and persevere in solving them K.G.1 - Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above,	Week 8

			below, beside, in front of, behind, and next to.	
Students will be able to: -Develop debugging skills -Develop their programming skills	Lesson 7: Programming with Harvester https://curriculum.code.org/csf-18/coursea/7/	Journaling and completed lesson on the computer	**K-12 Computer Science Standards** 1A-AP-08 - Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. 1A-AP-09 - Model the way programs store and manipulate data by using numbers or other symbols to represent information. 1A-AP-11 - Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions **Common Core English Language Arts Standards** K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. **Common Core Math Standards** MP.1 - Make sense of problems and persevere in solving them K.G.1 - Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	Week 9
Students will be able to: -Understand online safety -Recognize safe websites -Understand the types of information that are okay to share on the internet and the type of information that is private	Lesson 8: Going Places Safely https://curriculum.code.org/csf-18/coursea/8/	A completed worksheet identifying private and personal information.	**Common Core English Language Arts Standards** K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. **Common Core Math Standards** MP.1 - Make sense of problems and persevere in solving them	Week 10-11
Students will be able to: -Use loops to shorten repeating code.	Lesson 9: Happy Loops https://curriculum.code.org/csf-18/coursea/9/	Journaling	**K-12 Computer Science Standards** 1A-AP-09 - Model the way programs store and manipulate data by using numbers or other symbols to represent information. 1A-AP-10 - Develop programs with sequences and simple loops, to express ideas or address a problem. 1A-AP-14 - Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. **Common Core English Language Arts Standards**	Week 12

			K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. **Common Core Math Standards** MP.1 - Make sense of problems and persevere in solving them K.G.1 - Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	
Students will be able to : -Use loops for a program on the computer to shorten a task -Count the number of times an action should be repeated	Lesson 10: Loops with Harvester https://curriculum.code.org/csf-18/coursea/10/ Lesson 11: Loops with Laurel https://curriculum.code.org/csf-18/coursea/11/ Lesson 12: Ocean Scene with Loops https://curriculum.code.org/csf-18/coursea/12/	Journaling and completed activity on the computer	**K-12 Computer Science Standards** 1A-AP-09 - Model the way programs store and manipulate data by using numbers or other symbols to represent information. 1A-AP-10 - Develop programs with sequences and simple loops, to express ideas or address a problem. 1A-AP-14 - Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. **Common Core English Language Arts Standards** K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. **Common Core Math Standards** MP.1 - Make sense of problems and persevere in solving them K.G.1 - Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.	Week 13-15
Students will be able: -Differentiate an action from an event. -Identify actions that correlate to input events. -Create a story using sequence and event handlers. -Share the story with others.	Lesson 13: The Big Event Jr. https://curriculum.code.org/csf-18/coursea/13/#the-big-event-jr9 Lesson 14: On the Move with Events https://curriculum.code.org/csf-18/coursea/14/#on-the-move-with-events6	Students will complete a worksheet identifying different events and completed activities on the computer which include a completed story using coding.	**K-12 Computer Science Standards** 1A-AP-09 - Model the way programs store and manipulate data by using numbers or other symbols to represent information. 1A-AP-14 - Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. **Common Core English Language Arts Standards** K.SL.1 - Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.	Week 16-18

			Common Core Math Standards MP.1 - Make sense of problems and persevere in solving them	