Madison Public Schools
STEAM Grade 1 Curriculum

Written by:
Michelle D'Amico

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

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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 the 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 collection data
- Develop a simple schematic drawing
- Create a model
- Develop their use of technology
- Present information to an audience
- Support the First Grade science, math, and language arts curriculum

Along with the goals of Unit 1, Unit 2 aims to:

- Reinforce computer science curriculum
- Reinforce problem solving skills
- Reinforce collaboration with others
- Reinforce internet safety
- Develop a coded game or story
- Develop their use of technology
- Present information to an audience
- Support 1st grade 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 1st grade 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: Sound

Unit Summary:
In this unit, students will develop a greater understanding of sound and sound waves. Students will gain an understanding on sound, how we hear sound, how we use sounds, sound waves, and sign language. The final project will include students building a model of an instrument

Suggested Pacing: 18 lessons

Learning Targets

Unit Essential Questions:

- What is sound?
- What are sound waves?
- How do we hear sound?
- How can we use sound?

Unit Enduring Understandings:

- Sound is made up of vibrations.
- We hear sound through sound waves.
- We can change the pitch and volume of a sound.

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) Walk students through two building tasks. Explain each step of the engineering design process throughout the activities.	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

			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 Sounds	Identify sounds in the environment Use day 1 and 2 Sound Unit	Chart of sounds	**NGSS** **Performance Expectation** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound. **ELA/Literacy** W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. **Technology** 8.1.2.E.1 Use digital tools and online resources to explore a problem or issue. **Science and Engineering Practices and Disciplinary Core Idea** Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) 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)	Week 3

Describe sounds	Students will describe the sounds that different instruments make Use day 3 Sound Unit	Sound station worksheet	**NGSS** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound. **ELA/Literacy** W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. **Science and Engineering Practices and Disciplinary Core Idea** 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) 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) **Technology** 8.1.2.E.1 Use digital tools and online resources to explore a problem or issue.	Week 4
Identify facts and opinions about sound	Students will hear an article about sound. The class should chart information about sound. Groups will work together to sort information into facts and opinions. Use day 4 Sound Unit	Students should write an informative paragraph about sound.	**NGSS** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound.	Week 5

			ELA/Literacy W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. W.2.8 - Recall information from experiences or gather information from provided sources to answer a question.	
Identify different pitches	Students will learn the vocabulary words of pitch and volume. Students will identify the pitch of a sound. Use day 5 Sound Unit	Students should journal about what they have learned about sound so far in the unit.	**NGSS** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound. **ELA/Literacy** W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. **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 Idea** Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)	Week 6

			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)	
Describe how the ear works	Students will listen to a reading on how the ear works. As a class, they will chart new learning. Use day 1 from Week 2 Sound Unit	Write an informative paragraph on how the ear works	**NGSS** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound. **ELA/Literacy** W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. **Technology** 8.1.2.A.2 Create a document using a word processing application.	Week 7
Complete an experiment and record data Understand how sound travels and how we hear sound.	Students will complete an experiment watching how sound travels through yarn. Use day 2 and 3 from Week 2 Sound Unit	Complete experiment sheet by following directions.	**NGSS** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound.	Week 8-9

			ELA/Literacy W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. **Science and Engineering Practices and Disciplinary Core Idea** 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) Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) 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) **Technology** 8.2.5.C.1 Collaborate with peers to illustrate components of a designed system. **Math** Measurement and Data K.MD	
Review vocabulary words See the effects of sound waves	Students will review vocab with a partner. They will then complete a mini lab on how sound travels. Use day 4 and 5 from Week 2 Sound Unit	Complete experiment sheet by following directions.	**NGSS** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound.	Week 10-11

			ELA/Literacy W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. **Technology** 8.2.5.C.1 Collaborate with peers to illustrate components of a designed system.	
Create sound graphs	Students will create sound graphs by listening to their own recordings. Use day 1 Week 3 Sound Unit	Write a conclusion about sound waves.	**NGSS** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound. **ELA/Literacy** W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. **Science and Engineering Practices and Disciplinary Core Idea** Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) 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 12

			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)	
Identify sounds we can make	Students will complete stations identifying the sound they can make with their body and how they make it Use day 2 Week 3 Sound Unit	Write a conclusion on sounds we make.	**NGSS** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound. **ELA/Literacy** W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.	Week 13
Explain how people can communicate without sound Understand sign language	Students will study Helen Keller and understand how people communicate without being able to hear. Use day 4 and 5 Week 3 Sound Unit	Write an informative paragraph on Helen Keller or about what life would be like without sound.	**NGSS** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound. **ELA/Literacy** W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.	Week 14-15

Build an instrument	Students will use the engineering design process to build their own instrument. Use Week 4 Sound Unit	Students will share their instrument with the class, and a publish a piece of writing about their instrument.	**NGSS** **1-PS4-1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **Disciplinary Core Idea** **1-PS4.A**: Wave Properties Sound can make matter vibrate, and vibrating matter can make sound. **ELA/Literacy** W.1.7: Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. SL.1.1: Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. **Science and Engineering Practices and Disciplinary Core Idea** 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) **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	Week 16-18

			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.	

Unit 2 Overview

Unit Title: Introduction to Computer Science

Unit Summary:
This unit provides a more in-depth, advanced introduction of computer science and coding using code.org curriculum. Students will use skills learned in kindergarten such as commands including loops and events, to complete more advanced coding programs. 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.

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 course, students will create their very own custom game or story from Play Lab that they can share.

Suggested Pacing: About 15 Weeks

Learning Targets

Unit Essential Questions:
- 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 that being safe when they visit websites is similar to staying safe in real life. -Learn to recognize websites that are safe for them to visit. -Recognize if they should ask an adult they trust before they visit a particular website. -Explore what information is appropriate to be put online.	Lesson 3: Your Digital Footprint https://curriculum.code.org/csf-18/courseb/3/	Students will complete a worksheet in which they identify private vs. public information.	**K-12 Computer Science Standards:** AP - Algorithms & Programming 1B-IC-18 - Discuss computing technologies that have changed the world and express how those technologies influence, and are influenced by, cultural practices. **Common Core English Language Arts Standards:** **Speaking & Listening:** K.SL.1 - Participate in collaborative conversations with diverse partners about 1st grade topics and texts with peers and adults in small and larger groups. 1.SL.1.b - Build on others' talk in conversations by responding to the comments of others through multiple exchanges.	Week 1
Students will be able to: -Explain what coding is -Construct a program -Debug a program	Students will begin the lesson by watching a video explaining coding and review what coding is through group discussion. Lesson 5: Programming with Scrat https://curriculum.code.org/csf-18/courseb/5/	Journaling and completed online activity.	**K-12 Computer Science Standards:** AP - Algorithms & Programming 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 **Next Generation Science Standards:** ETS1 - Engineering Design	Weeks 2-3

Students will be able to: -Explain why it's not okay to claim that someone else's work is their own. -Create original art.	Lesson 6: It's create to Create and Play Fair	Journaling and completed superhero (own artwork)	**K-12 Computer Science Standards:** 1A-AP-13 - Give attribution when using the ideas and creations of others while developing programs. **Common Core English Language Arts Standards:** 1.SL.1 - Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. 1.SL.1.a - Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion). 1.SL.1.b - Build on others' talk in conversations by responding to the comments of others through multiple exchanges.	Week 4
Students will be able to: -Sequence commands in a logical order -Resolve coding problems.	Lesson 7: Programming with Rey and BB-8 https://curriculum.code.org/csf-18/courseb/7/	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 1st grade 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 5
Students will be able to: -Replace programing with loops	Lesson 8: My Loopy Robotic Friends Jr.	Journaling and completed lesson on the computer	**K-12 Computer Science Standards:** 1A-AP-08 - Model daily processes by creating and following algorithms	Week 6-11

-Create loops for repeated patterns -Improve code using loops -Count the number of times an action should be repeated and represent it as a loop	https://curriculum.code.org/csf-18/courseb/8/ Lesson 9: Loops with Scrat https://curriculum.code.org/csf-18/courseb/9/ Lesson 10: Loops with Laurel https://curriculum.code.org/csf-18/courseb/10/ Lesson 11: Drawing Gardens with Loops https://curriculum.code.org/csf-18/courseb/11/		(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 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 1st grade 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: -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 12: The Big Event Jr. https://curriculum.code.org/csf-18/courseb/12/ Lesson 13: A Royal Battle with Events https://curriculum.code.org/csf-18/courseb/13/	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. **Common Core Math Standards:** MP.1 - Make sense of problems and persevere in solving them	Week 12-15