Fairfield Public Schools

STEAM (Science, Technology, Engineering, Arts, and Mathematics), Computer Science and Design Thinking Curriculum

Written by:
Jennifer Valenti
Dorian Nazarian

February 15, 2022

Mission

STEAM refers to the areas of Science, Technology, Engineering, Arts, and Mathematics. The Fairfield Public Schools have integrated STEAM concepts into the curriculum starting in kindergarten and they are continued through all grades in the K-6 district. The STEAM program emphasizes critical thinking, problem-solving, investigation, collaboration, and creativity. Lessons are rooted in identifying problems and creating solutions. Students will work in an environment in which they are encouraged to think, question, collaborate, and make decisions. They will learn that there can be more than one correct answer and that it may be necessary to start over multiple times before finding a final solution. The Fairfield School District teaches students to think outside-of-the-box, take risks, and continue to persevere when solving any type of problem or challenge that pupils may have the opportunity to solve.

Vision

STEAM students will tinker, explore, invent, and design using the principles of science, technology, engineering, art, and mathematics. They will build and rebuild, think and rethink, design and redesign, using both technology and hands on materials. Students will struggle, fail, learn from their mistakes, and work through their problems. Our STEAM curriculum is designed to develop well-rounded students with a passion for lifelong learning who are well-equipped with the tools necessary to be successful citizens in the 21st century.

STEAM - Kindergarten		
Grade: Kindergarten	Unit 1:Theme: Technology	Time Frame: First Part of 8-week cycle
Summary: Unit 1 for kindergarten will focus on technology. Student activities will utilize the resources below. Students will be introduced to basic computer navigation skills and be taught relevant		

vocabulary. An introduction to computer science coding, virtual reality, augmented reality, and video conferencing will be incorporated during this unit, as well. Keyboarding skills will also be reinforced. (reworded)

Assessments

Formal:

- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:

- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
(Technology Literacy, Digital Citizenship, Computing Systems, Networks and the Internet, Impacts of Computing, Data & Analysis, Algorithms and Programming)

Learners will . . .

- Understand that digital tools have a purpose and that collaboration can simplify the work an individual has to do and sometimes produce a better product. (9.4.2.TL)
- Practice safe behavior when accessing the Internet and reflect on their online activity (9.4.2.DC)
- Discover that people interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information in digital form. (8.1.2.CS)
- Understand that computing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide

Related Standards Covered:

- Identify the basic features of a digital tool and explain its purpose. (9.4.2.TL.1)
- Create a document using a word processing application. (9.4.2.TL.2)
- Navigate a virtual space to build context and describe the visual content. (9.4.2.TL.4)
- Describe the difference between real and virtual experiences. (9.4.2.TL.5)
- Illustrate and communicate ideas and stories using multiple digital tools (9.4.2.TL.6)
- Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts (9.4.2.TL.7)
- Explain differences between ownership and sharing of information. (9.4.2.DC.1)
- Explain the importance of respecting the digital content of others. (9.4.2.DC.2)
- Explain how to be safe online and follow safe practices when using the internet (9.4.2.DC.3)
- Compare information that should be kept private to information that might be made public. (9.4.2.DC.4)
- Select and operate computing devices that perform a variety of tasks accurately and quickly based on user

greater connectivity in the computing world. (8.1.2.NI) • Comprehend that computing affects many aspects of the world in both positive and negative ways at local, national, and global levels. Individuals and communities influence computing through their behaviors and cultural and social interactions, and, in turn, computing influences new cultural practices. (8.1.2.IC) • Discover that computing systems exist to process data. The amount of digital data generated in the world is rapidly expanding, so the need to process data effectively is increasingly important. Data is collected and stored so that it can be analyzed to better understand the world and make more accurate predictions. (8.1.2.DA)	needs and preferences. (8.1.2.CS.1) • Explain the functions of common software and hardware components of computing systems. (8.1.2.CS.2) • Describe basic hardware and software problems using accurate terminology (8.1.2.CS.3) • Model and describe how individuals use computers to connect to other individuals, places, information, and ideas through a network. (8.1.2.NI.1) • Describe how the Internet enables individuals to connect with others worldwide. (8.1.2.NI.2) • Compare how individuals live and work before and after the implementation of new computing technology. (8.1.2.IC.1) • Data can be used to make predictions about the world. (8.1.2.DA.3 and 8.1.2.DA.4)
Desired Results	
Enduring Understandings: Students will be able to demonstrate . . . • Grade level appropriate technology vocabulary • Navigation of a virtual environment • The ability to input text and data • Technology is constantly changing and requires continuous learning of new skills • Appropriate user responsibilities • Digital responsibility at school and carry over to home use	Essential Questions: • How is technology used in daily life? • What are the benefits of technology? • How can I use technology to communicate my ideas? • Why is it important to be a good digital citizen, both at home and at school? • How does computer science affect our lives and future careers globally?
Instructional Plan	
Suggested Activities: • Introduction to technology terminology (browser, desktop, tab, window, minimize, maximize, etc.) • Practicing mouse skills (and trackpad introduction) • Keyboard awareness and layout (spacebar, backspace, enter key, shift, etc.) • Web navigation (ie: open a browser,	Possible Resources: • Coding (code.org, kodable.com) • Teacher-selected websites for reinforcement (starfall.com, abcya.com, funbrain.com, digipuzzle.net, arcademicskillbuilders.com, etc.) • NetSmartz, Common Sense Education • Coding Mice

access a website) ● Computer Science ○ Coding and unplugged coding ● Online Safety/Netiquette ● Apps: Quiver, ChatterPix, Wonder Workshop tools	● Let's Go Code Activity Set ● Dash robots ● iPads ● Chromebooks

STEAM - Kindergarten

Grade: Kindergarten Unit 2 Theme: Science (Motion. Earth's Systems) Time Frame: 2nd Part of 8-week cycle

Summary: Unit 2 for kindergarten will focus on science. Student activities will use the resources listed below to use the scientific process for solving using problem based learning. Students will use the science and engineering practices, disciplinary core ideas, and cross cutting concepts to demonstrate their understanding of the scientific process.

Assessments

Formal:

- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:

- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
Learners will . . .

- Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object (K-PS2-1).
- Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull (K-PS2-2).
- Use and share observations of local weather conditions to describe patterns over time. (K-ESS2-1)

Related Standards Covered:

- Pushes and pulls can have different strengths and directions. (KPS2-1),(K-PS2-2) Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1),(K-PS2-2)
- A bigger push or pull makes things speed up or slow down more quickly. (secondary to K-PS2-1)
- 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. (secondary to KPS2-2)
- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1)

Desired Results

Enduring Understandings:
Students will be able to demonstrate . . .

- Following established STEAM Lab rules and procedures ensures that students and faculty remain safe and increases the likelihood that challenges are met successfully.
- Scientists take on specific responsibilities in order to contribute to the success of the overall challenge.
- The Scientific Process involves asking questions, imagining possible solutions, planning a course of action, creating and testing a process or prototype, and analyzing results in order to make design improvements.
- Pushing and pulling on an object can change its speed or direction
- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Essential Questions:

- What is a scientist?
- What does a scientist do?
- What are the different types of scientists?
- How do we use the STEAM Lab and its equipment safely for science?
- How do we work together to meet our goals as scientists?
- What are the steps of the scientific process?
- How does friction affect movement?
- What happens if you push or pull an object harder?
- What patterns do we observe in the weather/seasons?

Instructional Plan

Suggested Activities:

- STEAM Lab Safety
- Simple Machines
- Ramps
- Slides
- Weather observations
- Data collection

Resources:

- Lab Overview
- Challenge materials: toothpicks, marshmallows, plastic cups, blocks, ramps, etc.
- YouTube introduction/background videos
- Generation Genius
- Mystery Science
- SciShow Kids
- Crash Course Kids
- Discovery Education

STEAM - Kindergarten

Grade: Kindergarten Unit 3 Theme: Engineering Time Frame: Third Part of 8-week cycle

Summary: Unit 3 for kindergarten will focus on engineering. Students will use the *engineering aspect of science to think critically and incorporate mathematics to develop new ideas, products, and technologies, often to make life simpler or more efficient. The Engineer Design Process (EDP) and its components will be introduced and utilized.* (reworded)

Assessments

Formal:
- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:
- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
(Engineering Design, Interaction of Technology and Humans, Nature of Technology, Effects of Technology on the Natural World, Ethics and Culture)

Learners will . . .
- Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)
- Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (K-2-ETS1-2)
- Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Related Standards Covered:
- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
- 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)
- Select and use appropriate tools and materials to build a product using the design process. (8.2.2.ED.3)
- Identify constraints and their role in the engineering design process. (8.2.2.ED.4)
- Identify how technology impacts or improves life. (8.2.2.ITH.3)

(K-2-ETS1-3) • Discover that Engineering Design allows for the effective and efficient development of products and systems. (8.2.2.ED) • Understand the ways society drives the improvement and creation of new technologies, and how technologies both serve and change society. (8.2.2.ITH) • Understand that the expansion and redistribution of the human population affects patterns of settlement, environmental changes, and resource use. Patterns and movements of population also relate to physical phenomena including climate variability, landforms, and locations of various natural hazards and their effects on population size, composition, and distribution. (8.2.2.NT) • Discover the positive and negative ways that technologies affect the natural world. (8.2.2.ETW) • Realize the profound effects that technologies have on people, how those effects can widen or narrow disparities, and the responsibility that people have for the societal consequences of their technological decisions. (8.2.2.EC)	• Design a solution to a problem affecting the community in a collaborative team and explain the intended impact of the solution. (8.2.2.ITH.5) • Brainstorm how to build a product, improve a designed product, fix a product that has stopped working, or solve a simple problem. (8.2.2.NT.2) • Explain how the disposal of or reusing a product affects the local and global environment. (8.2.2.ETW.4)
Desired Results	
Enduring Understandings: Students will be able to demonstrate . . . • How to solve a problem through engineering • The use of questioning, observing, and gathering information to help solve problems • A clear understanding of the problem is the first step • Designs can be conveyed through sketches, drawings, or physical models and will aid in communicating with others • Comparing and testing designs is a	Essential Questions: • How can you use questioning and observation to help solve problems? • How can comparing designs help to find a solution to a problem? • How do you determine materials and placements to create a strong object or tool? • Why is it important to test designs before putting them into use?

useful way to determine the best solution to a problem	
Instructional Plan	
Suggested Activities: Engineer Design Challenges (paired with literature) ● *Sky Boys* - building tall structures ● *21 Elephants* - building bridges ● *The Dot* - creativity challenges ● *Rosie Revere Engineer* - learning from mistakes ● *The Gingerbread Man* - build a disguise ● *Snowflake Bentley* - snowflake and snowman challenges ● *The Three Little Pigs* - build a sturdy structure ● Marble mazes	Resources: ● Challenge supplies may include: craft ticks, rubber bands, clothespins, binder clips, construction paper, glue, tape, pipe cleaners, paper towel rolls, coffee filters, etc. ● Websites for reference: ○ www.sciencea-z.com ○ www.education.com ○ www.youtube.com ○ www.science4us.com ○ www.SciShowKids.com ○ https://thekindergartenconnection.com/awesome-engineering-activities-kids/ ● Related literature

STEAM - Grade 1

Grade: **1** Unit 1 Theme: Technology Time Frame: First Part of 8-week cycle

Summary: Unit 1 for Grade 1 will focus on technology. Student activities will utilize the resources below. Students will continue to use basic computer navigation skills and expand on relevant vocabulary. An introduction to computer science coding, virtual reality, augmented reality, and video conferencing will continue to be incorporated during this unit, as well. Keyboarding skills will also continue to be reinforced. (reworded)

Assessments

Formal:

- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:

- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
(Technology Literacy, Digital Citizenship, Computing Systems, Networks and the Internet, Impacts of Computing, Data & Analysis, Algorithms and Programming)

Learners will . . .

- Understand that digital tools have a purpose and that collaboration can simplify the work an individual has to do and sometimes produce a better product. (9.4.2.TL)
- Practice safe behavior when accessing the Internet and reflect on their online activity (9.4.2.DC)
- Discover that people interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information

Related Standards Covered:

- Identify the basic features of a digital tool and explain its purpose. (9.4.2.TL.1)
- Create a document using a word processing application. (9.4.2.TL.2)
- Navigate a virtual space to build context and describe the visual content. (9.4.2.TL.4)
- Describe the difference between real and virtual experiences. (9.4.2.TL.5)
- Illustrate and communicate ideas and stories using multiple digital tools (9.4.2.TL.6)
- Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts (9.4.2.TL.7)
- Explain differences between ownership and sharing of information. (9.4.2.DC.1)
- Explain the importance of respecting the digital content of others. (9.4.2.DC.2)
- Explain how to be safe online and

in digital form. (8.1.2.CS) • Understand that computing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide greater connectivity in the computing world. (8.1.2.NI) • Comprehend that computing affects many aspects of the world in both positive and negative ways at local, national, and global levels. Individuals and communities influence computing through their behaviors and cultural and social interactions, and, in turn, computing influences new cultural practices. (8.1.2.IC) • Discover that computing systems exist to process data. The amount of digital data generated in the world is rapidly expanding, so the need to process data effectively is increasingly important. Data is collected and stored so that it can be analyzed to better understand the world and make more accurate predictions. (8.1.2.DA)	follow safe practices when using the internet (9.4.2.DC.3) • Compare information that should be kept private to information that might be made public. (9.4.2.DC.4) • Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences. (8.1.2.CS.1) • Explain the functions of common software and hardware components of computing systems. (8.1.2.CS.2) • Describe basic hardware and software problems using accurate terminology (8.1.2.CS.3) • Model and describe how individuals use computers to connect to other individuals, places, information, and ideas through a network. (8.1.2.NI.1) • Describe how the Internet enables individuals to connect with others worldwide. (8.1.2.NI.2) • Connecting devices to a network or the Internet provides great benefits, but care must be taken to use authentication measures, such as strong passwords, to protect devices and information from unauthorized access. (8.1.2.NI.3 and 8.1.2.NI.4) • Compare how individuals live and work before and after the implementation of new computing technology. (8.1.2.IC.1) • Store, copy, search, retrieve, modify, and delete data using a computing device. (8.1.2.DA.2) • Data can be used to make predictions about the world. (8.1.2.DA.3 and 8.1.2.DA.4)
Desired Results	
Enduring Understandings: Students will be able to demonstrate . . . • Grade level appropriate technology vocabulary • The ability to understand and use the features of an operating system and the ability to input text and data • The ability to use/create grade	Essential Questions: • How is technology used in daily life? • What are the benefits of technology? • How can I use technology to communicate my ideas? • Why is it important to be a good digital citizen, both at home and at school? • How does computer science affect our

appropriate documents ● The ability to create graphic organizers ● The ability to discuss the uses of technology at home and at school	lives and future careers globally?
Instructional Plan	
Suggested Activities: ● Introduction to Google Suite ○ Username and password login ○ Drive, Docs, Classroom, Drawing ● Continued development of technology terminology ● Continued keyboard layout awareness (end punctuation, commas, tab key, etc.) ● Web navigation (using shortcuts on school website) ● Computer Science ○ Coding and unplugged coding ● Online Safety/Netiquette ● Apps: Quiver, ChatterPix, Wonder Workshop tools	Possible Resources: ● Coding (code.org, kodable.com) ● Teacher-selected websites for reinforcement (starfall.com, abcya.com, funbrain.com, digipuzzle.net, arcademicskillbuilders.com, etc.) ● NetSmartz, Common Sense Education ● Coding Mice ● Let's Go Code Activity Set ● Dash robots ● iPads ● Chromebooks

STEAM - Grade 1

Grade: 1 Unit 2 Theme: Science (Earth) Time Frame: Second Part of 8-week cycle

Summary: Unit 2 for Grade 1 will focus on science. Student activities will use the resources listed below to use the scientific process for solving using problem based learning. Students will use the science and engineering practices, disciplinary core ideas, and cross cutting concepts to demonstrate their understanding of the scientific process.

Assessments

Formal:
- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:
- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
Learners will . . .
- Use observations of the sun, moon, and stars to describe patterns that can be predicted (1-ESS1-1).
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Related Standards Covered:
- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1).
- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1- ESS1-2).

Desired Results

Enduring Understandings:
Students will be able to demonstrate . . .
- Following established STEAM Lab rules and procedures ensures that students and faculty remain safe and increases the likelihood that challenges are met successfully.
- Scientists take on specific responsibilities in order to contribute to the success of the overall challenge.
- The Scientific Process involves asking questions, imagining possible solutions, planning a course of action,

Essential Questions:
- How do we use the STEAM Lab and its equipment safely for science?
- How do we work together to meet our goals as scientists?
- What are the steps of the scientific process?
- What predictable, observable patterns occur due to the motion of the sun, moon, and stars?
- How is the amount of daylight related to the time of year?

creating and testing a process or prototype, and analyzing results in order to make design improvements. ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.	
Instructional Plan	
Suggested Activities: ● STEAM Lab Safety ● Patterns in Space ○ Observe sky ○ Moon phase pictures ● Shadows - reflecting on the sun's place in the sky ● Sun's daily path across the sky ● The sun's energy - how it affects temperature of soil, air, and water in a predictable pattern	Resources: ● Lab Overview ● YouTube introduction/background videos ● Mysteryscience.com ● Supporting literature ● The sun's energy lesson

STEAM - Grade 1

Grade: **1** Unit 3 Theme: Engineering Time Frame: Third Part of 8-week cycle

Summary: Unit 3 for Grade 1 will focus on engineering. Students will use the engineering aspect of science to think critically and incorporate mathematics to develop new ideas, products, and technologies, often to make life simpler or more efficient. The Engineer Design Process (EDP) and its components will be introduced and utilized. (reworded)

Assessments

Formal:
- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:
- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
(Engineering Design, Interaction of Technology and Humans, Nature of Technology, Effects of Technology on the Natural World, Ethics and Culture)

Learners will . . .
- Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)
- Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (K-2-ETS1-2)
- Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs. (K-2-ETS1-3)

Related Standards Covered:
- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
- 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)
- Select and use appropriate tools and materials to build a product using the design process. (8.2.2.ED.3)
- Identify constraints and their role in the engineering design process. (8.2.2.ED.4)
- Identify how technology impacts or improves life. (8.2.2.ITH.3)
- Design a solution to a problem

• Discover that Engineering Design allows for the effective and efficient development of products and systems. (8.2.2.ED) • Understand the ways society drives the improvement and creation of new technologies, and how technologies both serve and change society. (8.2.2.ITH) • Understand that the expansion and redistribution of the human population affects patterns of settlement, environmental changes, and resource use. Patterns and movements of population also relate to physical phenomena including climate variability, landforms, and locations of various natural hazards and their effects on population size, composition, and distribution. (8.2.2.NT) • Discover the positive and negative ways that technologies affect the natural world. (8.2.2.ETW) • Realize the profound effects that technologies have on people, how those effects can widen or narrow disparities, and the responsibility that people have for the societal consequences of their technological decisions. (8.2.2.EC)	affecting the community in a collaborative team and explain the intended impact of the solution. (8.2.2.ITH.5) • Brainstorm how to build a product, improve a designed product, fix a product that has stopped working, or solve a simple problem. (8.2.2.NT.2) • Explain how the disposal of or reusing a product affects the local and global environment. (8.2.2.ETW.4)
Desired Results	
Enduring Understandings: Students will be able to demonstrate . . . • The shape and stability of structures of natural and designed objects are related to their function(s) • How to solve a problem through engineering • The use of questioning, observing, and gathering information to help solve problems • Designs can be conveyed through sketches, drawings, or physical models and will aid in communicating with others • Comparing and testing designs is a	Essential Questions: • How does sketching or creating a model to illustrate its shape help solve a given problem? • How does testing a model determine its strengths and weaknesses in solving a given problem? • How are asking questions, gathering information, and making observations helpful when thinking about problems?

useful way to determine the best solution to a problem	
Instructional Plan	
Suggested Activities: Engineer Design Challenges (paired with literature) ● *Sky Boys* - building tall structures ● *21 Elephants* - building bridges ● *The Dot* - creativity challenges ● *Rosie Revere Engineer* - learning from mistakes ● *The Gingerbread Man* - build a disguise ● *Snowflake Bentley* - snowflake and snowman challenges ● *The Three Little Pigs* - build a sturdy structure ● Marble mazes	Resources: ● Challenge supplies may include: craft ticks, rubber bands, clothespins, binder clips, construction paper, glue, tape, pipe cleaners, paper towel rolls, coffee filters, etc. ● Websites for reference: ○ www.sciencea-z.com ○ www.education.com ○ www.youtube.com ○ www.science4us.com ○ www.SciShowKids.com ○ www.betterlesson.com ○ www.thestemlabratory.com ○ www.teachengineering.org ○ http://www.eie.org/ ● Related literature

STEAM - Grade 2

Grade: **2** Unit 1 Theme: Technology Time Frame: First Part of 8-week cycle

Summary: Unit 1 for Grade 2 will focus on technology. Student activities will utilize the resources below. Students will continue to use basic computer navigation skills and expand on relevant vocabulary. An introduction to computer science coding, virtual reality, augmented reality, and video conferencing will continue to be incorporated during this unit, as well. Keyboarding skills will also continue to be reinforced. (reworded)

Assessments

Formal:

- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:

- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
(Technology Literacy, Digital Citizenship, Computing Systems, Networks and the Internet, Impacts of Computing, Data & Analysis, Algorithms and Programming)

Learners will . . .

- Understand that digital tools have a purpose and that collaboration can simplify the work an individual has to do and sometimes produce a better product. (9.4.2.TL)
- Practice safe behavior when accessing the Internet and reflect on their online activity (9.4.2.DC)
- Discover that people interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information

Related Standards Covered:

- Identify the basic features of a digital tool and explain its purpose. (9.4.2.TL.1)
- Create a document using a word processing application. (9.4.2.TL.2)
- Enter information into a spreadsheet and sort the information. (9.4.2.TL.3)
- Navigate a virtual space to build context and describe the visual content. (9.4.2.TL.4)
- Describe the difference between real and virtual experiences. (9.4.2.TL.5)
- Illustrate and communicate ideas and stories using multiple digital tools (9.4.2.TL.6)
- Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts (9.4.2.TL.7)
- Explain differences between ownership and sharing of information. (9.4.2.DC.1)
- Explain the importance of respecting the digital content of others.

in digital form. (8.1.2.CS) • Understand that computing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide greater connectivity in the computing world. (8.1.2.NI) • Comprehend that computing affects many aspects of the world in both positive and negative ways at local, national, and global levels. Individuals and communities influence computing through their behaviors and cultural and social interactions, and, in turn, computing influences new cultural practices. (8.1.2.IC) • Discover that computing systems exist to process data. The amount of digital data generated in the world is rapidly expanding, so the need to process data effectively is increasingly important. Data is collected and stored so that it can be analyzed to better understand the world and make more accurate predictions. (8.1.2.DA)	(9.4.2.DC.2) • Explain how to be safe online and follow safe practices when using the internet (9.4.2.DC.3) • Compare information that should be kept private to information that might be made public. (9.4.2.DC.4) • Explain what a digital footprint is and how it is created. (9.4.2.DC.5) • Identify respectful and responsible ways to communicate in digital environments. (9.4.2.DC.6) • Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences. (8.1.2.CS.1) • Explain the functions of common software and hardware components of computing systems. (8.1.2.CS.2) • Describe basic hardware and software problems using accurate terminology (8.1.2.CS.3) • Model and describe how individuals use computers to connect to other individuals, places, information, and ideas through a network. (8.1.2.NI.1) • Describe how the Internet enables individuals to connect with others worldwide. (8.1.2.NI.2) • Connecting devices to a network or the Internet provides great benefits, but care must be taken to use authentication measures, such as strong passwords, to protect devices and information from unauthorized access. (8.1.2.NI.3 and 8.1.2.NI.4) • Compare how individuals live and work before and after the implementation of new computing technology. (8.1.2.IC.1) • Store, copy, search, retrieve, modify, and delete data using a computing device. (8.1.2.DA.2) • Data can be used to make predictions about the world. (8.1.2.DA.3 and 8.1.2.DA.4)
Desired Results	
Enduring Understandings:	Essential Questions:

Students will be able to demonstrate . . . ● Grade level appropriate technology vocabulary ● The ability to understand and use the features of an operating system and the ability to input text and data ● The ability to use/create grade appropriate documents ● The ability to create graphic organizers ● The ability to discuss the uses of technology at home and at school ● The ability to produce and interpret graphs and charts by entering data into a spreadsheet ● The ability to appropriately use a search engine to facilitate research	● How can I use technology to communicate my ideas? ● What can I learn about the global community by sharing ideas with students in other states/countries? ● Why is it important to be a good digital citizen, both at home and at school? ● How does computer science affect our lives and future careers globally?
Instructional Plan	
Suggested Activities: ● Review Google Suite ○ Username and password ○ Login procedures ● Continue introducing Google Suite apps (Classroom, Docs, Slides, Drawing, Sheets) ● Computer Science Coding ○ Coding and unplugged coding ○ Ozobots ● Online Safety/Netiquette ● Continued development of technology terminology ● Continued keyboard layout awareness (end punctuation, commas, tab key, etc.) ● Web navigation (using shortcuts on school website) ● Apps: Quiver, ChatterPix, Wonder Workshop tools ● Keyboarding skills	Possible Resources: ● Google Drive, Docs, Classroom, Drawing, Slides, Sheets ● Coding (code.org, kodable.com) ● Google Chrome ● Teacher selected websites for content reinforcement (abcya.com, digipuzzle.com, pre-selected websites depending on season and content) ● NetSmartz, Common Sense ● Dance Mat Typing ● Coding Mice ● Let's Go Code Activity Set ● Dash robots ● iPads ● Chromebooks

STEAM - Grade 2

Grade: 2 Unit 2 Theme: Science (Earth) Time Frame: 2nd Part of 8-week cycle

Summary: Unit 2 for Grade 2 will focus on science. Students will use the resources listed below to use the scientific process for solving using problem based learning. Students will use the science and engineering practices, disciplinary core ideas, and cross cutting concepts to demonstrate their understanding of the scientific process.

Assessments

Formal:
- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:
- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
Learners will . . .
- Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land (2-ESS2-1.).
- Develop a model to represent the shapes and kinds of land and bodies of water in an area (2-ESS2-2).
- Obtain information to identify where water is found on Earth and that it can be solid or liquid (2-ESS2-3).

Related Standards Covered:
- Wind and water can change the shape of the land. (2- ESS2-1).
- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2).
- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3).

Desired Results

Enduring Understandings:
Students will be able to demonstrate . . .
- Following established STEAM Lab rules and procedures ensures that students and faculty remain safe and increases the likelihood that challenges are met successfully.
- Scientists take on specific responsibilities in order to contribute to the success of the overall

Essential Questions:
- How do we use the STEAM Lab and its equipment safely for science?
- How do we work together to meet our goals as scientists?
- What are the steps of the scientific process?
- What are different solutions designed to prevent wind or water changing the shape of land?

challenge. ● The Scientific Process involves asking questions, imagining possible solutions, planning a course of action, creating and testing a process or prototype, and analyzing results in order to make design improvements. ● Patterns in the natural world can be observed. ● Things may change slowly or rapidly such as erosion of rocks, glaciers melting, volcanic explosions, and earthquakes. ● Humans have designed multiple solutions to slow or prevent wind or water from changing the shape of the land, such as windbreaks, shrubs, grass and trees.	● How can a map represent the shape and kind of water in a specified area? ● Where and why is water on Earth found in both solid and liquid form?
Instructional Plan	
Suggested Activities: ● STEAM Lab Safety ● If you floated down a river . . .? ● Why is there sand at the beach? ● What is strong enough to make a canyon? ● Preventing Wind Erosion ● Effects of Wind and Water	Resources: ● Lab Overview ● Mysteryscience.com lesson plans ● YouTube introduction/background videos ● Supporting literature ● Wind Erosion lesson plan

STEAM - Grade 2

Grade: **2** Unit 3 Theme: Engineering Time Frame: Third Part of 8-week cycle

Summary: Unit 3 for Grade 2 will focus on engineering. Students will use the engineering aspect of science to think critically and incorporate mathematics to develop new ideas, products, and technologies, often to make life simpler or more efficient. The Engineer Design Process (EDP) and its components will be introduced and utilized. (reworded)

Assessments

Formal:

- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:

- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
(Engineering Design, Interaction of Technology and Humans, Nature of Technology, Effects of Technology on the Natural World, Ethics and Culture)

Learners will . . .

- Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)
- Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (K-2-ETS1-2)
- Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs. (K-2-ETS1-3)
- Discover that Engineering Design

Related Standards Covered:

- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
- 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)
- Select and use appropriate tools and materials to build a product using the design process. (8.2.2.ED.3)
- Identify constraints and their role in the engineering design process. (8.2.2.ED.4)
- Identify how technology impacts or improves life. (8.2.2.ITH.3)
- Design a solution to a problem affecting the community in a

allows for the effective and efficient development of products and systems. (8.2.2.ED) • Understand the ways society drives the improvement and creation of new technologies, and how technologies both serve and change society. (8.2.2.ITH) • Understand that the expansion and redistribution of the human population affects patterns of settlement, environmental changes, and resource use. Patterns and movements of population also relate to physical phenomena including climate variability, landforms, and locations of various natural hazards and their effects on population size, composition, and distribution. (8.2.2.NT) • Discover the positive and negative ways that technologies affect the natural world. (8.2.2.ETW) • Realize the profound effects that technologies have on people, how those effects can widen or narrow disparities, and the responsibility that people have for the societal consequences of their technological decisions. (8.2.2.EC)	collaborative team and explain the intended impact of the solution. (8.2.2.ITH.5) • Brainstorm how to build a product, improve a designed product, fix a product that has stopped working, or solve a simple problem. (8.2.2.NT.2) • Explain how the disposal of or reusing a product affects the local and global environment. (8.2.2.ETW.4)
Desired Results	
Enduring Understandings: Students will be able to demonstrate . . . • The shape and stability of structures of natural and designed objects are related to their function(s) • How to solve a problem through engineering • The use of questioning, observing, and gathering information to help solve problems • Designs can be conveyed through sketches, drawings, or physical models and will aid in communicating with others • Comparing and testing designs is a useful way to determine the best	Essential Questions: • How does sketching or creating a model to illustrate its shape help solve a given problem? • How does testing a model determine its strengths and weaknesses in solving a given problem? • How are asking questions, gathering information, and making observations helpful when thinking about problems?

solution to a problem	
Instructional Plan	
Suggested Activities: Engineer Design Challenges (paired with literature) ● *Sky Boys* - building tall structures ● *21 Elephants* - building bridges ● *The Dot* - creativity challenges ● *Rosie Revere Engineer* - learning from mistakes ● *The Gingerbread Man* - build a disguise ● *Snowflake Bentley* - snowflake and snowman challenges ● *The Three Little Pigs* - build a sturdy structure ● Marble mazes ● The Sturdy Swine ● Build a Community ● Paper Towel Towers	Resources: ● Challenge supplies may include: craft ticks, rubber bands, clothespins, binder clips, construction paper, glue, tape, pipe cleaners, paper towel rolls, coffee filters, etc. ● Websites for reference: ○ www.sciencea-z.com ○ www.education.com ○ www.youtube.com ○ www.science4us.com ○ www.SciShowKids.com ○ www.betterlesson.com ○ www.thestemlabratory.com ○ www.teachengineering.org ○ http://www.eie.org/ ● Related literature

STEAM - Grade 3

Grade: **3** Unit 1 Theme: Technology Time Frame: First Part of 8-week cycle

Summary: Unit 1 for Grade 3 will focus on technology. Student activities will utilize the resources below. Students will continue to use basic computer navigation skills and expand on relevant vocabulary. An introduction to computer science coding, virtual reality, augmented reality, and video conferencing will continue to be incorporated during this unit, as well. Keyboarding skills will also continue to be reinforced. (reworded)

Assessments

Formal:

- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:

- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:

- Computing devices may be connected to other devices to form a system as a way to extend their capabilities.
- Software and hardware work together as a system to accomplish tasks (e.g., sending, receiving, processing, and storing units of information).
- Shared features allow for common troubleshooting strategies that can be effective for many systems.
- Distinguishing between public and private information is important for safe and secure online interactions.
- The development and modification of computing technology is driven by people's needs and wants and can affect individuals differently.
- Data can be organized, displayed, and presented to highlight relationships.
- Programs can be broken down into smaller parts to facilitate their design, implementation, and review. Programs can also be created by incorporating

Related Standards Covered

- 8.1.5.CS.1: Model how computing devices connect to other components to form a system
- 8.1.5.CS.2: Model how computer software and hardware work together as a system to accomplish tasks.
- 8.1.5.CS.3: Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.
- 8.1.5.NI.2: Describe physical and digital security measures for protecting sensitive personal information.
- 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes.
- 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
- 8.1.5.DA.3: Organize and present

smaller portions of programs that already exist. • Technology spurs new businesses and careers. • Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world. • The technology developed for the human designed world can have unintended consequences for the environment. • Technology must be continually developed and made more efficient to reduce the need for nonrenewable resources. • Technological choices and opportunities vary due to factors such as differences in economic resources, location, and cultural values. • Individuals should practice safe behaviors when using the Internet. • Collaborating digitally as a team can often develop a better artifact than an individual working alone. • Different digital tools have different purposes.	collected data visually to communicate insights gained from different views of the data. • 8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development. • 8.1.5.AP.5: Modify, remix, or incorporate pieces of existing programs into one's own work to add additional features or create a new program. • 8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career. • 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies. • 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems. • 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved. • 9.4.5.DC.1: Explain the need for and use of copyrights • 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have • copyright restrictions. • 9.4.5.TL.1Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each. • Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).
Desired Results	
Enduring Understandings: Students will be able to demonstrate . . . • Grade level appropriate technology vocabulary • The ability to understand and use the features of an operating system and the ability to input text and data • The ability to use/create grade	Essential Questions: • How can I use technology to communicate my ideas? • What can I learn about the global community by sharing ideas with students in other states/countries? • How has the use of digital tools improved opportunities for

appropriate documents • The ability to create graphic organizers • The ability to discuss the uses of technology at home and at school • The ability to practice safe internet usage • The ability to understand the impact of technology on society • The ability to recognize and exhibit ethical behaviors when using technology and understand the consequences of misuse • Problem solving independently and collaboratively	communication and collaboration? • Why is the evaluation and appropriate use of accurate information more important than ever in the technological age? • Why is it important to be a good digital citizen, both at home and at school? • How does computer science affect our lives and future careers globally?
Instructional Plan	

Suggested Activities:
• Review login procedures
  ○ Create username and password
• Continue introducing Google Suite apps (Classroom, Docs, Slides, Drawing, Sheets)
• Computer Science Coding
  ○ Coding and unplugged coding
  ○ Ozobots
• Online Safety/Netiquette
• Continued development of technology terminology
• Continued keyboard layout awareness (end punctuation, commas, tab key, etc.)
• Web navigation (using shortcuts on school website)
• Apps: Quiver, ChatterPix, Wonder Workshop tools
• Keyboarding skills
• 3D Printer - TinkerCAD
	Possible Resources:
	• Google Drive, Docs, Classroom, Drawing, Slides, Sheets
	• Coding (code.org, kodable.com, Code Combat)
	• Google Chrome
	• Teacher selected websites for content reinforcement (abcya.com, digipuzzle.com, pre-selected websites depending on season and content)
	• NetSmartz, Common Sense
	• Dance Mat Typing
	• Coding Mice
	• Let's Go Code Activity Set
	• Dash robots
	• iPads
	• Chromebooks

STEAM - Grade 3

Grade: **3** Unit 2 Theme: Science (Earth's Systems) Time Frame: 2nd Part of 8-week cycle

Summary: Unit 2 for Grade 3 will focus on science. Students will use the resources listed below to use the scientific process for solving using problem based learning. Students will use the science and engineering practices, disciplinary core ideas, and cross cutting concepts to demonstrate their understanding of the scientific process.

Assessments

Formal:
- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:
- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
Learners will . . .
- Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season (3-ESS2-1).
- Obtain and combine information to describe climates in different regions of the world (3-ESS2-2).

Related Standards Covered:
- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next (3-ESS2-1).
- Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years (3-ESS2-2).

Desired Results

Enduring Understandings:
Students will be able to demonstrate . . .
- Following established STEAM Lab rules and procedures ensures that students and faculty remain safe and increases the likelihood that challenges are met successfully.
- Scientists take on specific responsibilities in order to contribute to the success of the overall

Essential Questions:
- How do we use the STEAM Lab and its equipment safely for science?
- How do we work together to meet our goals as scientists?
- What are the steps of the scientific process?
- How do meteorologists measure and predict the weather?
- What is severe weather?

challenge. ● The Scientific Process involves asking questions, imagining possible solutions, planning a course of action, creating and testing a process or prototype, and analyzing results in order to make design improvements. ● Meteorologists measure the weather using a variety of scientific tools, collecting data, and analyzing patterns. ● Severe weather is weather that is more intense than average and has the ability to cause damage. Examples include hurricanes, tornadoes, flooding, drought, blizzards, and lightening.	● How can we lessen the impact of severe weather?
Instructional Plan	
Suggested Activities: ● STEAM Lab Safety ● Measuring Weather ● What is Severe Weather? ● Hurricane Tower Challenge ● Preventing Flooding Challenge	Resources: ● Lab Overview ● Challenge materials (varied) ● YouTube introduction/background videos (brainpop.com) ● Supporting literature ● Precipitation Measurement Missions (NASA) ● Disaster Master Game ● Weatherproof Your Home

STEAM - Grade 3

Grade: **3** Unit 3 Theme: Engineering Time Frame: Third Part of 8-week cycle

Summary: Unit 3 for Grade 3 will focus on engineering. Students will use the engineering aspect of science to think critically and incorporate mathematics to develop new ideas, products, and technologies, often to make life simpler or more efficient. The Engineer Design Process (EDP) and its components will be introduced and utilized. (reworded)

Assessments

Formal:
- Performance/project-based assessments using rubrics/checklists
- Written student self-reflection
- Peer evaluation of group work/collaboration

Informal:
- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion guide
- Brainstorming think-sessions
- Entrance/exit slips

Established Goals

Overarching Goals:
- Collaboration can simplify the work an individual has to do and sometimes produce a better product.
- Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge.
- Often, several design solutions exist, each better in some way than the others.
- Engineering design requirements include desired features and limitations that need to be considered.
- Societal needs and wants determine which new tools are developed to address real-world problems.
- A new tool may have favorable or unfavorable results as well as both positive and negative effects on society. Technology spurs new businesses and careers.
- Technology innovation and improvement may be influenced by a

Related Standards Covered:
- 8.2.5.ED.1: Explain the functions of a system and its subsystems.
- 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
- 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
- 8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process.
- 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and tradeoffs identified in the design process.

variety of factors. ● Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world. ● The technology developed for the human designed world can have unintended consequences for the environment. ● Technology must be continually developed and made more efficient to reduce the need for non-renewable resources.	● 8.2.5.WITH.1: Explain how societal needs and wants influence the development and function of a product and a system. ● 8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have. ● 8.2.5.WITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use. ● 8.2.5.WITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career. ● 8.2.5.NT.1: Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem. ● 8.2.5.NT.2: Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies. ● 8.2.5.NT.3: Redesign an existing product for a different purpose in a collaborative team. ● 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies. ● 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.
Desired Results	
Enduring Understandings: Students will be able to demonstrate . . . ● People's needs and wants change over time, as do their demands for new and improved technologies. ● Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. ● How to solve a problem through	Essential Questions: ● How do new and improved technologies meet the needs of people as their demands change? ● How does sketching or creating a model to illustrate its shape help solve a given problem? ● How does testing a model determine its strengths and weaknesses in solving a given problem? ● How are asking questions, gathering

engineering ● The use of questioning, observing, and gathering information to help solve problems ● Designs can be conveyed through sketches, drawings, or physical models and will aid in communicating with others ● Comparing and testing designs is a useful way to determine the best solution to a problem	information, and making observations helpful when thinking about problems?
Instructional Plan	
Suggested Activities: MakerSpace/Engineer Design ● Swing Set Makeover Challenge ● Straw Towers to the Moon ● Pop Rockets on a Shoestring Budget ● Engineering a Habitat's Humidity ● Magnet Engineering Design Challenge ● Explain how engineers solve problems ● Pretzerella ED Challenge ● Build a Link Chain Challenge ● Balloons Over Broadway ● Million Dollar Geo Man	Resources: ● Challenge supplies may include: craft ticks, rubber bands, clothespins, binder clips, construction paper, glue, tape, pipe cleaners, paper towel rolls, coffee filters,magnets, etc. ● Websites for reference: ○ www.sciencea-z.com ○ www.education.com ○ www.youtube.com ○ www.science4us.com ○ www.SciShowKids.com ○ www.betterlesson.com ○ www.thestemlabratory.com ○ www.teachengineering.org ○ http://www.eie.org/ ○ PBS.org: Design Squad Activity Guide ● Related literature

STEAM - Grade 4

Grade: 4 Unit 1 -Theme: Technology Time Frame: First Part of 8-week cycle

Summary: Unit 1 for Grade 4 will focus on technology. Student activities will utilize the resources listed below, incorporated into the steps of the Engineering Design Process. Students will determine the reputability of online sources and incorporate appropriate digital citizenship.

Resources: TinkerCAD, Google Suite, Code.org, Ozobots, Cue Robots, YouTube, Common Sense Education, Toytheater.com, ABCya.com, Mindgames.com, Funbrain.com, Stop Motion Animation.com

Assessments

Formal:

- Performance/project-based assessments using rubric and checklist.
- Written student self-reflection.
- Peer evaluation of group work/collaboration.
- Challenge Papers
- Project Proposals

Informal:

- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion Guide
- Brainstorm think sessions
- Assessments (Entrance/Exit Slips)

Established Goals

Overarching Goals:

- Computing devices may be connected to other devices to form a system as a way to extend their capabilities.
- Software and hardware work together as a system to accomplish tasks (e.g., sending, receiving, processing, and storing units of information).
- Shared features allow for common troubleshooting strategies that can be effective for many systems.
- Distinguishing between public and private information is important for safe and secure online interactions.
- The development and modification of computing technology is driven by people's needs and wants and can affect individuals differently.
- Data can be organized, displayed, and presented to highlight relationships.
- Programs can be broken down into

Related Standards Covered

- 8.1.5.CS.1: Model how computing devices connect to other components to form a system
- 8.1.5.CS.2: Model how computer software and hardware work together as a system to accomplish tasks.
- 8.1.5.CS.3: Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.
- 8.1.5.NI.2: Describe physical and digital security measures for protecting sensitive personal information.
- 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes.
- 8.1.5.DA.1: Collect, organize, and

smaller parts to facilitate their design, implementation, and review. Programs can also be created by incorporating smaller portions of programs that already exist. • Technology spurs new businesses and careers. • Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world. • The technology developed for the human designed world can have unintended consequences for the environment. • Technology must be continually developed and made more efficient to reduce the need for nonrenewable resources. • Technological choices and opportunities vary due to factors such as differences in economic resources, location, and cultural values. • Individuals should practice safe behaviors when using the Internet. • Collaborating digitally as a team can often develop a better artifact than an individual working alone. • Different digital tools have different purposes.	display data in order to highlight relationships or support a claim. • 8.1.5.DA.3: Organize and present collected data visually to communicate insights gained from different views of the data. • 8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development. • 8.1.5.AP.5: Modify, remix, or incorporate pieces of existing programs into one's own work to add additional features or create a new program. • 8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career. • 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies. • 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems. • 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved. • 9.4.5.DC.1: Explain the need for and use of copyrights • 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have • copyright restrictions. • 9.4.5.TL.1Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each. • Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).
Desired Results	
Enduring Understandings: • Use the Internet as a resource for information. • Use technology to solve problems, develop decision-making skills, and	Essential Questions: • How can I use technology responsibly? • How can I best use technology in the global economy?

participate in project-based learning activities that support curriculum objectives. • Follow copyright laws and policies concerning acceptable use.	• Why is it important to use technology and engineering in our daily lives?
Instructional Plan	
Suggested Activities: • Coding: • Video Conferencing: • Multi-Media Creation • Robotics • Digital Architecture • Stop Motion Animation • Stop Motion Videos	Possible Resources • TinkerCAD • Cue Robots • ABCya.com • Tynker.com • Google Suite • Code.org • Ozobots • Toytheater.com • FunBrain.com • Mindgames.com • Stop Motion Animation.com

STEAM - Grade 4

Grade: 4 Unit 2 Theme: Science-Energy Time Frame: Second Part of 8-week cycle

Summary: Unit 2 for Grade 4 will focus on science. Students will use the resources listed below to use the scientific process for solving using problem based learning. Students will use the science and engineering practices, disciplinary core ideas, and cross cutting concepts to demonstrate their understanding of the scientific process.

Resources: Hands-on materials used to problem solve and move through the 3 stages of learning (concrete, pictorial and abstract) to cement understanding. Science labs, inquiry documents, and Google Suite will be utilized throughout the cycle.

Assessments

Formal:
- Performance/project-based assessments using rubric and checklist.
- Written student self-reflection.
- Peer evaluation of group work/collaboration.

Informal:
- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion Guide
- Brainstorm think sessions
- Assessments (Entrance/Exit Slips)

Established Goals

Overarching Goals:
Learners will...
- Use evidence to construct an explanation relating the speed of an object to the energy of that object (4-PS3-1).
- Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents (4-PS3-2.
- Ask questions and predict outcomes about the changes in energy that occur when objects collide (4-PS3-3).
- Apply scientific ideas to design, test, and refine a device that converts energy from one form to another (4-PS3-4).

Related Standards Covered:
- The faster a given object is moving, the more energy it possesses. (4-PS3-1).
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3).
- Energy can be transferred in various ways and between objects. (4-PS3-1),(4- PS3-2),(4-PS3-3),(4-PS3-4).
- Most scientists and engineers work in teams. (4-PS3-4).
- Science affects everyday life. (4-PS3-4).

Desired Results

Enduring Understandings: Learners will... ● Following established STEAM Lab rules and procedures ensures that students and faculty remain safe and increases the likelihood that challenges are met successfully. ● Scientists take on specific responsibilities in order to contribute to the success of the overall challenge. ● The Scientific Process involves asking questions, imagining possible solutions, planning a course of action, creating and testing a process or prototype, and analyzing results in order to make design improvements.	Essential Questions: ● How do we work together to meet our goals as scientists? ● What are the steps of the Scientific Process? ● How do the steps of the Scientific Process relate to the Engineering Design Process? ● Why is it critical to use the scientific process when researching, creating or testing anything?
Instructional Plan	
Suggested Activities: ● Hills and Stored Energy The first hill of the roller coaster is always the highest because it creates the stored energy the coaster car requires to progress through the ride. Students will build a roller coaster with hills and compare how the energy of a marble changes at different points of the ride. ● Static Electricity Stations Static electricity is the result of an imbalance between negative and positive charges in an object. Students will create a positive or negative charge on a variety of objects to demonstrate the phenomenon of static electricity. ● Safety Makes “Scents” Challenge Energy Transfer through different materials ● Winter Sports Challenges Ski Jump, Snowboarding, and Bobbledding challenges with speed, distance, velocity over different supplies	Possible Resources: ● Hills and Stored Energy Challenge- The first hill of the roller coaster is always the highest because it creates the stored energy the coaster car requires to progress through the ride. ● Students will build a roller coaster with hills and compare how the energy of a marble changes at different points of the ride. ● Criterion referenced PowerPoint Presentation. ● Criterion referenced student activity sheet ● Conductors and Insulators ● Potential to Kinetic Energies ● The Science of the Olympics

STEAM - Grade 4

Grade: 4 Unit 3 Theme: Engineering Time Frame: Third Part of 8-week cycle

Summary: Unit 3 for Grade 4 will focus on engineering. Students will use the Engineering Design Process *to think critically, and incorporate mathematics to develop new ideas, products, and technologies, in order to solve problems while staying within budget. These Engineering practices will focus on career readiness, life literacies, and life skills.*

Resources: Hands-on materials used to problem solve and move through the Engineering Design Process to create long-lasting, ingrained understanding. Challenge sheets, project proposals, inquiry documents, and Google Suite will be utilized throughout the cycle.

Assessments

Formal:

- Performance/project-based assessments using rubric and checklist.
- Written student self-reflection.
- Peer evaluation of group work/collaboration.

Informal:

- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion Guide
- Brainstorm think sessions
- Assessments (Entrance/Exit Slips)

Established Goals

Overarching Goals:

- Collaboration can simplify the work an individual has to do and sometimes produce a better product.
- Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge.
- Often, several design solutions exist, each better in some way than the others.
- Engineering design requirements include desired features and limitations that need to be considered.
- Societal needs and wants determine which new tools are developed to address real-world problems.
- A new tool may have favorable or unfavorable results as well as both

Related Standards Covered:

- 8.2.5.ED.1: Explain the functions of a system and its subsystems.
- 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
- 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
- 8.2.5.ED.5: Describe how specifications and limitations impact

positive and negative effects on society. Technology spurs new businesses and careers. • Technology innovation and improvement may be influenced by a variety of factors. • Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world. • The technology developed for the human designed world can have unintended consequences for the environment. • Technology must be continually developed and made more efficient to reduce the need for non-renewable resources.	the engineering design process. • 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and tradeoffs identified in the design process. • 8.2.5.WITH.1: Explain how societal needs and wants influence the development and function of a product and a system. • 8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have. • 8.2.5.WITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use. • 8.2.5.WITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career. • 8.2.5.NT.1: Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem. • 8.2.5.NT.2: Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies. • 8.2.5.NT.3: Redesign an existing product for a different purpose in a collaborative team. • 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies. • 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.
Desired Results	
Enduring Understandings: • Use the engineering design model to solve problems and reflect for personal growth. • Use engineering to solve problems, develop decision-making skills, and	Essential Questions: • What is the Engineering Design Process? • What is engineering and why is it important to use the engineering design process?

participate in project-based learning activities that support curriculum objectives. • Use and follow copyright laws and policies concerning acceptable use for engineering design and notebook. • Solve problems presented in a variety of literature and/or pertaining to current and cultural events.	• How do engineers solve problems? • Why are copyrights important to use in engineering and in the world? • How can the EDP be used in life outside the STEAM lab?
Instructional Plan	
Suggested Activities • Rube Goldberg Machines (2 sessions) Students will plan a chain reaction machine that will help to carry out a simple task in a complicated way by transferring the energy of one colliding object to another. • Sound Energy: Cup Telephones Sound energy is caused by vibrations and travels in sound waves. Students will observe how sound can travel through string and cups and work to design a better cup telephone model. • On Account of the Gum Challenge: Research, design, and construct apparatuses to eliminate various substances • Thanksgiving Float/Balloon Puppet Challenge • Rule Design Challenge • Paper Chain, Tower, and Pipe Cleaner Surprises Challenge • Ish-ations Challenge: Using shadow art and design to create objects	Possible Resources • Criterion referenced Google Slides Presentation • Criterion referenced student activity sheet • OK Go Music Video (This Too Shall Pass) • Criterion referenced PowerPoint Presentation • Mystery Science: How Far Can a Whisper Travel? • Mystery Science activity sheet • The Works Handson Museum • *On Account of the Gum* by Adam Rex • *Balloons Over Broadway* by Melissa Sweet • *Ish* by Peter J. Reynolds • *Beautiful Oops* by Barney Saltzburg • *Shadowology* by Vincent Bal

STEAM - Grade 5

Grade: 5 Unit 1 -Theme: Technology Time Frame: First Part of 8-week cycle

Summary: Unit 1 for Grade 5 will focus on technology. Student activities will utilize the resources listed below, incorporated into the steps of the Engineering Design Process. Students will determine the reputability of online sources and incorporate appropriate digital citizenship.

Resources: TinkerCAD, Google Suite, Code.org, Ozobots, Cue Robots, YouTube, Common Sense Education, Toytheater.com, ABCya.com, Mindgames.com, Funbrain.com, Stop Motion Animation.com

Assessments

Formal:

- Performance/project-based assessments using rubric and checklist.
- Written student self-reflection.
- Peer evaluation of group work/collaboration.
- Challenge Papers
- Project Proposals

Informal:

- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion Guide
- Brainstorm think sessions
- Assessments (Entrance/Exit Slips)

Established Goals

Overarching Goals:

- Computing devices may be connected to other devices to form a system as a way to extend their capabilities.
- Software and hardware work together as a system to accomplish tasks (e.g., sending, receiving, processing, and storing units of information).
- Shared features allow for common troubleshooting strategies that can be effective for many systems.
- Distinguishing between public and private information is important for safe and secure online interactions.
- The development and modification of computing technology is driven by people's needs and wants and can affect individuals differently.

Related Standards Covered

- 8.1.5.CS.1: Model how computing devices connect to other components to form a system
- 8.1.5.CS.2: Model how computer software and hardware work together as a system to accomplish tasks.
- 8.1.5.CS.3: Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.
- 8.1.5.NI.2: Describe physical and digital security measures for protecting sensitive personal information.
- 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe

• Data can be organized, displayed, and presented to highlight relationships. • Programs can be broken down into smaller parts to facilitate their design, implementation, and review. Programs can also be created by incorporating smaller portions of programs that already exist. • Technology spurs new businesses and careers. • Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world. • The technology developed for the human designed world can have unintended consequences for the environment. • Technology must be continually developed and made more efficient to reduce the need for nonrenewable resources. • Technological choices and opportunities vary due to factors such as differences in economic resources, location, and cultural values. • Individuals should practice safe behaviors when using the Internet. • Collaborating digitally as a team can often develop a better artifact than an individual working alone. • Different digital tools have different purposes.	the factors that influenced the changes. • 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim. • 8.1.5.DA.3: Organize and present collected data visually to communicate insights gained from different views of the data. • 8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development. • 8.1.5.AP.5: Modify, remix, or incorporate pieces of existing programs into one's own work to add additional features or create a new program. • 8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career. • 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies. • 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems. • 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved. • 9.4.5.DC.1: Explain the need for and use of copyrights • 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have • copyright restrictions. • 9.4.5.TL.1Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each. • Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).
• **Desired Results**	
Enduring Understandings: • Use the Internet as a resource for information.	Essential Questions: • How can I use technology responsibly?

• Use technology to solve problems, develop decision-making skills, and participate in project-based learning activities that support curriculum objectives. • Follow copyright laws and policies concerning acceptable use.	• How can I best use technology in the global economy? • Why is it important to use technology and engineering in our daily lives?

Instructional Plan

Suggested Activities: • Coding: • Video Conferencing: • Multi-Media Creation • Robotics • Digital Architecture • Stop Motion Animation • Stop Motion Videos	Possible Resources • TinkerCAD • Cue Robots • ABCya.com • Tynker.com • Google Suite • Code.org • Ozobots • Toytheater.com • FunBrain.com • Mindgames.com • Stop Motion Animation.com

STEAM - Grade 5

Grade: 5 Unit 2 Theme: Science-Earth's Systems: Time Frame: 2nd Part of 8 week cycle

Summary: Unit 2 for Grade 5 will focus on science. Students will use the resources listed below to use the scientific process for solving using problem based learning. Students will use the science and engineering practices, disciplinary core ideas, and cross cutting concepts to demonstrate their

understanding of the scientific process.

Resources: Hands-on materials used to problem solve and move through the 3 stages of learning (concrete, pictorial and abstract) to cement understanding. Science labs, inquiry documents, and Google Suite will be utilized throughout the cycle.

Assessments

Formal:	Informal:
● Performance/project-based assessments using rubric and checklist. ● Written student self-reflection. ● Peer evaluation of group work/collaboration.	● Teacher observation ● Class discussion/participation ● Classwork ● Anecdotal notes ● Discussion Guide ● Brainstorm think sessions ● Assessments (Entrance/Exit Slips)

Established Goals

Overarching Goals:	Related Standards Covered:
● 5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. ● 5-ESS2-2. Describe and graph the amounts of salt, water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	ESS2.A: Earth Materials and Systems Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans) (5-ESS2-1). ● ESS2.C: The Roles of Water in Earth's Surface Processes Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5- ESS2-2)

Desired Results

Enduring Understandings:	Essential Questions:
● Less than 1% of Earth's water is potable and easily accessible. To purify sewage water for reuse requires several steps. ● Global warming is melting frozen water at Earth's poles, causing sea levels to rise. ● Earth's major systems are the geosphere, hydrosphere, atmosphere, and biosphere. These systems interact in a variety of ways that affect Earth's surface materials and processes.	● What percentage of Earth's water is potable? ● How is water purified in nature? ● What systems do humans use to purify water? ● How does global climate change affect Earth's water resources? ● How do the geosphere, biosphere, hydrosphere, and/or atmosphere interact? ● How do individual communities use science

● Humans must develop new technologies to help counteract and cope with climate change.	ideas to protect the Earth's resources and environment?
Instructional Plan	
Suggested Activities ● Water Filter Challenge - Students will design and build water filters using plastic water bottles and a variety of filtering materials. ● Using US Weather Data to Draw Conclusions - Students will graph weather data to determine if large bodies of water really do moderate the temperatures of adjacent land masses. ● Sky Floater Challenge - Students will experiment with small weights until they achieve neutral buoyancy for a floating mylar balloon. ● Pipeline Challenge - Students will research both sides of the debate as well as the construction of pipelines over various terrain and elevation changes. Students will simulate pipeline construction as completing companies ● Bridge the Gap Challenge - Students will research different types of bridges, and design, and construct their own bridges given specific materials.	Resources: ● JPL Education - NASA Website STEM Labs for Middle Grades by Schyrlet Cameron and Carolyn Craig. ● Summary of Monthly Normals (2010) from www.ncdc.noaa.gov. ● PBS - Design Squad Teacher's Guide, Breezy Blimps. ● Keystone Pipeline National Geographic ● Pipeline Construction ● NOVA Online - Bridges ● *Iggy Peck Architect* by Andrea Beaty

STEAM - Grade 5

Grade: 5 Unit 3 Theme: Engineering Time Frame: Third Part of 8-week cycle

Summary: Unit 3 for Grade 5 will focus on engineering. Students will use the Engineering Design Process *to think critically, and incorporate mathematics to develop new ideas, products, and technologies, in order to solve problems while staying within budget. These Engineering practices will focus on career readiness, life literacies, and life skills.*

Resources: Hands-on materials used to problem solve and move through the Engineering Design Process to create long-lasting, ingrained understanding. Challenge sheets, project proposals, inquiry documents, and Google Suite will be utilized throughout the cycle.

Assessments

Formal:
- Performance/project-based assessments using rubric and checklist.
- Written student self-reflection.
- Peer evaluation of group work/collaboration.

Informal:
- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion Guide
- Brainstorm think sessions
- Assessments (Entrance/Exit Slips)

Established Goals

Overarching Goals:
- Collaboration can simplify the work an individual has to do and sometimes produce a better product.
- Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge.
- Often, several design solutions exist, each better in some way than the others.
- Engineering design requirements include desired features and limitations that need to be considered.
- Societal needs and wants determine which new tools are developed to address real-world problems.
- A new tool may have favorable or unfavorable results as well as both positive and negative effects on society. Technology spurs new businesses and careers.

Related Standards Covered:
- 8.2.5.ED.1: Explain the functions of a system and its subsystems.
- 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
- 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
- 8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process.
- 8.2.5.ED.6: Evaluate and test alternative solutions to a problem

• Technology innovation and improvement may be influenced by a variety of factors. • Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world. • The technology developed for the human designed world can have unintended consequences for the environment. • Technology must be continually developed and made more efficient to reduce the need for non-renewable resources.	using the constraints and tradeoffs identified in the design process. • 8.2.5.WITH.1: Explain how societal needs and wants influence the development and function of a product and a system. • 8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have. • 8.2.5.WITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use. • 8.2.5.WITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career. • 8.2.5.NT.1: Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem. • 8.2.5.NT.2: Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies. • 8.2.5.NT.3: Redesign an existing product for a different purpose in a collaborative team. • 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies. • 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.
Desired Results	
Enduring Understandings: • Use the engineering design model to solve problems and reflect for personal growth. • Use engineering to solve problems, develop decision-making skills, and participate in project-based learning activities that support curriculum objectives. • Use and follow copyright laws and	Essential Questions: • What is the Engineering Design Process? • What is engineering and why is it important to use the engineering design process? • How do engineers solve problems? • Why are copyrights important to use in engineering and in the world? • How can the EDP be used in life

policies concerning acceptable use for engineering design and notebook. ● Solve problems presented in a variety of literature and/or pertaining to current and cultural events.	outside the STEAM lab?
Instructional Plan	
Suggested Activities ● Rube Goldberg Machines (2 sessions) Students will plan a chain reaction machine that will help to carry out a simple task in a complicated way by transferring the energy of one colliding object to another. ● Sound Energy: Cup Telephones Sound energy is caused by vibrations and travels in sound waves. Students will observe how sound can travel through string and cups and work to design a better cup telephone model. ● On Account of the Gum Challenge: Research, design, and construct apparatuses to eliminate various substances ● Thanksgiving Float/Balloon Puppet Challenge ● Rule Design Challenge ● Paper Chain, Tower, and Pipe Cleaner Surprises Challenge ● Ish-ations Challenge: Using shadow art and design to create objects ● "Gas" Powered Cars - Students will design, build, and race cars that run on the gas expelled from a balloon. ● Build a boat that paddles itself using a rubber band as its power source. ● Engineering Edge Exhibition- Students will design and build an invention of their choice that will help society. Inventions will be showcased at their exhibition.	Possible Resources ● Criterion referenced Google Slides Presentation ● Criterion referenced student activity sheet ● OK Go Music Video (This Too Shall Pass) ● Criterion referenced PowerPoint Presentation ● Mystery Science: How Far Can a Whisper Travel? ● Mystery Science activity sheet ● The Works Handson Museum ● *On Account of the Gum* by Adam Rex ● *Balloons Over Broadway* by Melissa Sweet ● *Ish* by Peter J. Reynolds ● *Beautiful Oops* by Barney Saltzburg ● *Shadowology* by Vincent Bal Resources: ● STEM Labs for Middle Grades -Mark Twain Media, page 18 ● NASA at Glenn EDCs-Let it Glide: https://www.nasa.gov/glenn-edcs-let-it-glide ● Design Squad PBS Kids:https://pbskids.org/designsquad/pdf/parentseducators/DS_Act_Guide_complete.pdf

STEAM - Grade 6

Grade: 6 Unit 1 -Theme: Technology Time Frame: First Part of 8-week cycle

Summary: Unit 1 for Grade 6 will focus on technology. Student activities will utilize the resources listed below, incorporated into the steps of the Engineering Design Process. Students will determine the reputability of online sources and incorporate appropriate digital citizenship.

Resources: TinkerCAD, Google Suite, Code.org, Ozobots, Cue Robots, YouTube, Common Sense Education, Toytheater.com, ABCya.com, Mindgames.com, Funbrain.com, Stop Motion Animation.com

Assessments

Formal:
- Performance/project-based assessments using rubric and checklist.
- Written student self-reflection.
- Peer evaluation of group work/collaboration.
- Challenge Papers
- Project Proposals

Informal:
- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion Guide
- Brainstorm think sessions
- Assessments (Entrance/Exit Slips)

Established Goals

Overarching Goals:
- Computing devices may be connected to other devices to form a system as a way to extend their capabilities.
- Software and hardware work together as a system to accomplish tasks (e.g., sending, receiving, processing, and storing units of information).
- Shared features allow for common troubleshooting strategies that can be effective for many systems.
- Distinguishing between public and private information is important for safe and secure online interactions.
- The development and modification of computing technology is driven by people's needs and wants and can affect individuals differently.
- Data can be organized, displayed, and presented to highlight relationships.
- Programs can be broken down into smaller parts to facilitate their design, implementation, and review. Programs can also be created by incorporating smaller portions of programs that already exist.

Related Standards Covered
- 8.1.5.CS.1: Model how computing devices connect to other components to form a system
- 8.1.5.CS.2: Model how computer software and hardware work together as a system to accomplish tasks.
- 8.1.5.CS.3: Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.
- 8.1.5.NI.2: Describe physical and digital security measures for protecting sensitive personal information.
- 8.1.5.IC.1: Identify computing technologies that have impacted how individuals live and work and describe the factors that influenced the changes.
- 8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
- 8.1.5.DA.3: Organize and present collected data visually to communicate insights gained from different views of

• Technology spurs new businesses and careers. • Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world. • The technology developed for the human designed world can have unintended consequences for the environment. • Technology must be continually developed and made more efficient to reduce the need for nonrenewable resources. • Technological choices and opportunities vary due to factors such as differences in economic resources, location, and cultural values. • Individuals should practice safe behaviors when using the Internet. • Collaborating digitally as a team can often develop a better artifact than an individual working alone. • Different digital tools have different purposes.	the data. • 8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development. • 8.1.5.AP.5: Modify, remix, or incorporate pieces of existing programs into one's own work to add additional features or create a new program. • 8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career. • 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies. • 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems. • 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved. • 9.4.5.DC.1: Explain the need for and use of copyrights • 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have • copyright restrictions. • 9.4.5.TL.1Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each. • Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).
Desired Results	
Enduring Understandings: • Use the Internet as a resource for information. • Use technology to solve problems, develop decision-making skills, and participate in project-based learning activities that support curriculum objectives. • Follow copyright laws and policies concerning acceptable use.	Essential Questions: • How can I use technology responsibly? • How can I best use technology in the global economy? • Why is it important to use technology and engineering in our daily lives?

Instructional Plan	
Suggested Activities: • Coding: • Video Conferencing: • Multi-Media Creation • Robotics • Digital Architecture • Stop Motion Animation • Stop Motion Videos	Possible Resources • TinkerCAD • Cue Robots • ABCya.com • Tynker.com • Google Suite • Code.org • Ozobots • Toytheater.com • FunBrain.com • Mindgames.com • Stop Motion Animation.com

STEAM - Grade 6

Grade: 6 Unit 2 Theme: Science-Earth's Systems Time Frame: 2nd Part of 8-week cycle

Summary: Unit 2 for Grade 6 will focus on science. Students will use the resources listed below to use the scientific process for solving using problem based learning. Students will use the science and engineering practices, disciplinary core ideas, and cross cutting concepts to demonstrate their understanding of the scientific process.

Resources: Hands-on materials used to problem solve and move through the 3 stages of learning (concrete, pictorial and abstract) to cement understanding. Science labs, inquiry documents, and Google Suite will be utilized throughout the cycle.

<table>
<tr><th colspan="2">Assessments</th></tr>
<tr><td>Formal:
Performance/project-based assessments using rubric and checklist.
Written student self-reflection.
Peer evaluation of group work/collaboration.</td><td>Informal:
Teacher observation
Class discussion/participation
Classwork
Anecdotal notes
Discussion Guide
Brainstorm think sessions
Assessments (Entrance/Exit Slips)</td></tr>
<tr><th colspan="2">Established Goals</th></tr>
<tr><td>Overarching Goals:
HS-ESS2-1. Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth systems.
HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.</td><td>Related Standards Covered:
What are Earth’s internal surfaces?
Why is it important to understand Earth’s surfaces globally?
Why does the Earth’s surface change over time?
How do people preserve and care for the Earth?
Why do human beings and companies need to think about how to protect the Earth?
What are the Earth’s properties of water and the affect on society and humans?</td></tr>
<tr><th colspan="2">Desired Results</th></tr>
<tr><td>Enduring Understandings:
● Earth’s systems are interconnected. A change in one system can affect another.
● Technology allows scientists, such as meteorologists and geologists, to better understand Earth’s systems and how and when they may change.
● Scientists and engineers are studying the effects of global climate change and developing new technologies for coping with these changes.</td><td>Essential Questions:
● How do changes in one part of an Earth system affect other parts of the system?
● How does technology extend human senses and understanding of Earth?
● How can mankind cope with global climate change?</td></tr>
<tr><th colspan="2">Instructional Plan</th></tr>
<tr><td>Suggested Activities
Battling for Oxygen (Simulation) -</td><td>Resources:
●teachengineering.org/activities/view/cub_air</td></tr>
</table>

Using gumdrops and toothpicks, students conduct a large-group, interactive ozone depletion model. ● Global Warming Challenge - Students will design a tool or process for counteracting or coping with climate change. This is a multiple-session project. ● Uncle Fred's Fix Challenge- Research, design, and create prototypes based on researched animal adaptations to aide in the care of zoo animals. ● Most Magnificent Thing Challenge - Research, design, and create models of different types of vehicles to meet the (researched) needs of a variety of different types of animals.	_lesson 08_activity1 ●http://www.education.noaa.gov/tweather.html ●Rosie Revere Engineer by Andrea Beaty ●The Most Magnificent Thing by Ashley Spires

STEAM - Grade 6

Grade: 6 Unit 3 Theme: Engineering Time Frame: Third Part of 8-week cycle

Summary: Unit 3 for Grade 6 will focus on engineering. Students will use the Engineering Design Process *to think critically, and incorporate mathematics to develop new ideas, products, and technologies, in order to solve problems while staying within budget. These Engineering practices will focus on career readiness, life literacies, and life skills.*

Resources: Hands-on materials used to problem solve and move through the Engineering Design Process to create long-lasting, ingrained understanding. Challenge sheets, project proposals, inquiry documents, and Google Suite will be utilized throughout the cycle.

Assessments

Formal:
- Performance/project-based assessments using rubric and checklist.
- Written student self-reflection.
- Peer evaluation of group work/collaboration.

Informal:
- Teacher observation
- Class discussion/participation
- Classwork
- Anecdotal notes
- Discussion Guide
- Brainstorm think sessions
- Assessments (Entrance/Exit Slips)

Established Goals

Overarching Goals:
- Collaboration can simplify the work an individual has to do and sometimes produce a better product.
- Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge.
- Often, several design solutions exist, each better in some way than the others.
- Engineering design requirements include desired features and limitations that need to be considered.
- Societal needs and wants determine which new tools are developed to address real-world problems.
- A new tool may have favorable or

Related Standards Covered:
- 8.2.5.ED.1: Explain the functions of a system and its subsystems.
- 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
- 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
- 8.2.5.ED.5: Describe how

unfavorable results as well as both positive and negative effects on society. Technology spurs new businesses and careers. • Technology innovation and improvement may be influenced by a variety of factors. • Engineers create and modify technologies to meet people's needs and wants; scientists ask questions about the natural world. • The technology developed for the human designed world can have unintended consequences for the environment. • Technology must be continually developed and made more efficient to reduce the need for non-renewable resources.	specifications and limitations impact the engineering design process. • 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and tradeoffs identified in the design process. • 8.2.5.WITH.1: Explain how societal needs and wants influence the development and function of a product and a system. • 8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have. • 8.2.5.WITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use. • 8.2.5.WITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career. • 8.2.5.NT.1: Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem. • 8.2.5.NT.2: Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies. • 8.2.5.NT.3: Redesign an existing product for a different purpose in a collaborative team. • 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies. • 8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.
Desired Results	
Enduring Understandings: • Use the engineering design model to solve problems and reflect for personal growth. • Use engineering to solve problems,	Essential Questions: • What is the Engineering Design Process? • What is engineering and why is it important to use the engineering

develop decision-making skills, and participate in project-based learning activities that support curriculum objectives. • Use and follow copyright laws and policies concerning acceptable use for engineering design and notebook. • Solve problems presented in a variety of literature and/or pertaining to current and cultural events.	design process? • How do engineers solve problems? • Why are copyrights important to use in engineering and in the world? • How can the EDP be used in life outside the STEAM lab?
Instructional Plan	
Suggested Activities • Rube Goldberg Machines (2 sessions) Students will plan a chain reaction machine that will help to carry out a simple task in a complicated way by transferring the energy of one colliding object to another. • Sound Energy: Cup Telephones Sound energy is caused by vibrations and travels in sound waves. Students will observe how sound can travel through string and cups and work to design a better cup telephone model. • On Account of the Gum Challenge: Research, design, and construct apparatuses to eliminate various substances • Thanksgiving Float/Balloon Puppet Challenge • Rule Design Challenge • Paper Chain, Tower, and Pipe Cleaner Surprises Challenge • Ish-ations Challenge: Using shadow art and design to create objects	Possible Resources • Criterion referenced Google Slides Presentation • Criterion referenced student activity sheet • OK Go Music Video (This Too Shall Pass) • Criterion referenced PowerPoint Presentation • Mystery Science: How Far Can a Whisper Travel? • Mystery Science activity sheet • The Works Handson Museum • *On Account of the Gum* by Adam Rex • *Balloons Over Broadway* by Melissa Sweet • *Ish* by Peter J. Reynolds • *Beautiful Oops* by Barney Saltzburg • *Shadowology* by Vincent Bal