Readington Township Public Schools

K-2 Computer Science

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Readington Township Public Schools

Computer Science and Design Thinking
K-2

Strategies

Teacher presentation
Teacher read-aloud
Group discussion
Small Group instruction
Group presentations

Accommodations

Accommodations and Modification Addendum

Assessments

Formative	Summative
- Classroom Discussion - Anecdotal Notes from teacher observation - Cooperative Learning Groups - Exit Slips - Open Ended Questions - Checklists - Teacher Observation - Running Records	- Unit Tests - Quizzes - Assignments in Google Classroom - Projects

Benchmark	Alternative
- Notebook check with rubric - End of unit presentation with rubric	- Presentations - Performance Assessments - Role Play

Resources

Required	Supplemental
- Chromebooks - Google Suite - Kodable - Code.org - Common Sense Media	- Weekly Reader - Scholastic News - Brain Pop - YouTube Videos

Computing Systems

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. (NJDOE)

Core Ideas	Performance Expectations
Individuals use computing devices to perform a variety of tasks accurately and quickly. Computing devices interpret and follow the instructions they are given literally.	8.1.2.CS.1: Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.

A computing system is composed of software and hardware.	8.1.2.CS.2: Explain the functions of common software and hardware components of computing systems.
Describing a problem is the first step toward finding a solution when computing systems do not work as expected.	8.1.2.CS.3: Describe basic hardware and software problems using accurate terminology.

Scope and Sequence
Lesson Activities

Kindergarten: 1 Class Period
- [What are Computers for Kids | Intro to Computers | Programming for Kids](#)
- The teacher will use the proper terminology when talking to students about their computers.
- Teacher lead discussion on what hardware and software are and show some examples.
- Students will learn about input, storage, processing, and output and explore the history of computers and the features they all share. [How Computers Work: What Makes a Computer, a Computer?](#)

First: 2 Class Periods
- Teachers will guide students to perform a task. Teachers will indicate the program to be used and then indicate why.
- Students will be asked which program would best complete the task at hand.
- Students will identify and label parts of the computer and what it does.
  - [Parts of a Computer visual](#) (or display) and review as a class.
  - [BrainPopJr. Video on the Parts of the Computer](#)
- Teacher lead discussion on troubleshooting.
  - [K-2 Troubleshooting](#)

Second: 1 Class Period
- Students will watch the Code.org [Hardware/Software video](#) and identify what is hardware/software. Together we will discuss computer terminology, problems with hardware and software, and the functions of both hardware and software and computing systems.
- Vocabulary Terms: Hardware, Circuits, Chips, Plugs, Wires, Speakers, Software, Programs, Code, Central Processing Unit, Binary Code, Operating Systems.

Networks and the Internet

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. (NJDOE)

Core Ideas	Performance Expectations
Computer networks can be used to connect individuals to other individuals, places, information, and ideas. The Internet enables individuals to connect with others worldwide.	• 8.1.2.NI.1: Model and describe how individuals use computers to connect to other individuals, places, information, and ideas through a network. • 8.1.2.NI.2: Describe how the Internet enables individuals to connect with others worldwide.
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: Create a password that secures access to a device. Explain why it is important to create unique passwords that are not shared with others. • 8.1.2.NI.4: Explain why access to devices need to be secured

Scope and Sequence

Lesson Activities

Kindergarten: 1 Class Period
- Common Sense Media - Pause and Think Online
  - Students will develop an understanding of the importance of being safe, responsible, and respectful online.
  - Students will watch and listen to the "Pause & Think Online" song and ABCYA Cyber-Five and discuss basic digital citizenship concepts.
  - Together the class will discuss how to be safe, responsible, and respectful online
  - Students will watch ABCYA Cyber-Five. Class discussion will include important safety tips for using technology safely, responsibly, and respectfully.
  - Students will share how they can safely use technology at home, at school, and in our community.
  - Vocabulary Terms: online, pause, digital citizenship

First: 2 Class Periods
- Common Sense Media - Safety in My Online Neighborhood
  - Students will discover, share and model how we use the internet to visit faraway places, connect to others, gather information, and share ideas.
  - Students will discuss how the internet allows us to connect with others from all over the world.
  - Students will compare how staying safe online is similar to staying safe in the real world.
  - Together we will discuss how to be a good digital citizen and use the internet safely, responsibly, and respectfully.
  - Together we will watch My Online Neighborhood.   Class discussion will include how we use the internet to visit places, connect with others, and gather and share information. Important safety tips will be discussed for using technology safely, responsibly, and respectfully.
  - Students will draw and share something they would like to do on the internet. (examples: virtual field trip to a zoo, zooming with grandma, researching a new game).   Additional Resource - What is the Internet?t?
  - Vocabulary Terms: online, internet, website or app, digital citizenship

Second: 2 Class Periods
- **Common Sense Media Lesson - Password Power- Up**
  - Students will define the term "password" and describe its purpose of securing access to a device and why access to devices need to be secured.
  - Students will develop an understanding of the importance of creating a strong, unique password and not sharing your password with others.
  - Students will come up with strong/unique passwords.
  - Students will complete the Digital Passport Game found in Commonsense Media.
  - Vocabulary Terms: password, phrase, symbol, username

Impacts of Computing
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. (NJDOE)

Core Ideas	Performance Expectations
Computing technology has positively and negatively changed the way individuals live and work (e.g., entertainment, communication, productivity tools).	8.1.2.IC.1: Compare how individuals live and work before and after the implementation of new computing technology.
Scope and Sequence Lesson Activities	

Kindergarten: 3 Class Periods
- Students will compare old and new technologies in a matching game and take part in role plays about how life would be different with the older technologies.
- Students will discuss how innovations have changed our community, and how our community might change with future innovations. This will lead to a session designed to elicit imaginative responses about altering current technologies.
- Students will imagine and draw their own "new and improved" telephone of the future and talk about their new invention on a class Flipgrid page. (Sustainable Schools NJ)

First: 2 Class Periods
- Read *Ada Lovelace, Poet of Science: The First Computer Programmer* (or a similar book). Discuss the author's note in the end with the key dates of her timeline, the gap before the computer was built and her authenticity being challenged in the 1990s.
- Students will explore past and present technology.
- Students will practice identifying changes to digital technology devices by identifying and sorting devices into the correct column - past/old or present/new technology.

Second: 3 Class Periods
- [How Computers Work_ What Makes a Computer, a Computer_](#) - **Code.org & Edpuzzle**
- Students will examine what technology is and compare how technology has been used in the past to the modern day.
- Students will discuss how the implementation of new technology has impacted their lives and the workforce.
- Students will participate in a class discussion that will include the comparison of old and new technology and the impact it has on our lives as well as the workforce. Examples will include when driving and using maps to navigate where to go.
- Students will work in groups creating two posters, one of the technology that is used in their lives from the moment they wake up until they go to sleep and what was used before this technology was invented.
- Vocabulary Terms: designer, inventor, inventions input, process, storage, output

Data and Analysis

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. (NJDOE)

Core Ideas	Performance Expectations
Individuals collect, use, and display data about individuals and the world around them.	8.1.2.DA.1: Collect and present data, including climate change data, in various visual formats.
Computers store data that can be retrieved later. Data can be copied, stored in multiple locations, and retrieved.	8.1.2.DA.2: Store, copy, search, retrieve, modify, and delete data using a computing device.
Data can be used to make predictions about the world.	• 8.1.2.DA.3: Identify and describe patterns in data visualizations. • 8.1.2.DA.4: Make predictions based on data using charts or graphs.

Scope and Sequence
Lesson Activities

Kindergarten: 1 Class Period
- Students will classify objects into given categories, count the number of objects in each category and sort the categories by count.
- Students will examine their data and share any patterns that they see with their data
- Students will use a pictograph to present their information and make a prediction based on their results.

- Vocabulary Terms: pictograph, cells, spreadsheet, input, data

First: 4 Class Periods
- Google Sheets will be used throughout the Spring for recording weather in Science.
- Students will become "meteorologists" analyzing the data and making predictions.
- Students will use various charts and graphs to showcase their data.   Together we will discuss weather and climate change and the difference between the two. NASA Climate Kids

Second: 3 Class Periods
- Students will use Google Sheets to collect, organize and present data.
- Students will survey classmates on topics of their choice (for example favorite ice cream/pet).
- Students will be responsible for inputting, organizing, and presenting their data.
- Students will copy, search, retrieve, modify, and delete data in Google Sheets.

Algorithms & Programming

An algorithm is a sequence of steps designed to accomplish a specific task. Algorithms are translated into programs, or code, to provide instructions for computing devices. Algorithms and programming control all computing systems, empowering people to communicate with the world in new ways and solve compelling problems. (NJDOE)

Core Ideas	Performance Expectations
Individuals develop and follow directions as part of daily life. A sequence of steps can be expressed as an algorithm that a computer can process.	8.1.2.AP.1: Model daily processes by creating and following algorithms to complete tasks.
Real world information can be stored and manipulated in programs as data (e.g., numbers, words, colors, images).	8.1.2.AP.2: Model the way programs store and manipulate data by using numbers or other symbols to represent information.
Computers follow precise sequences of steps that automate tasks.	8.1.2.AP.3: Create programs with sequences and simple loops to accomplish tasks.
Complex tasks can be broken down into simpler instructions, some of which can be broken down even further.	8.1.2.AP.4: Break down a task into a sequence of steps.
People work together to develop programs for a purpose, such as expressing ideas or addressing problems. The development of a program involves identifying a sequence of events, goals, and expected outcomes, and addressing errors (when necessary).	• 8.1.2.AP.5: Describe a program's sequence of events, goals, and expected outcomes. • 8.1.2.AP.6: Debug errors in an algorithm or program that includes sequences and simple loops.

Scope and Sequence
Lesson Activities

Kindergarten: 8 class periods throughout the year
- Students will be introduced to coding as a language.
- Students will explore the role humans play in making machines function
- Students will apply basic commands to move through simple mazes.
- Students will be introduced to logic statements.
- Students will be able to alter the path of a program using conditions.
- Resources: Bee Bots, Code.org, Kodable

First: 8 class periods throughout the year
- Students will apply algorithms to complete computational tasks.

- Students will apply the sequence to robotics and math. (Kodable Lessons)
- Students will apply simple conditions to solve mazes and unlock the ability to design and share the maze

Second: 8 class periods throughout the year
- Students will be able to decompose a real-world problem into sub-steps. Predict the outcome of scripts, and consider potential errors. (Kodable Lessons)
- Students will solve mazes with multiple conditions and justify decisions with increased complexity.

Engineering Design

People design for enjoyment and to solve problems, extend human capabilities, satisfy needs and wants, and improve the human condition. Engineering Design, a systematic approach to creating solutions to technological problems and finding ways to meet people's needs and desires, allows for the effective and efficient development of products and systems. (NJDOE)

Core Ideas	Performance Expectations
Engineering design is a creative process for meeting human needs or wants that can result in multiple solutions.	• 8.2.2.ED.1: Communicate the function of a product or device. • 8.2.2.ED.2: Collaborate to solve a simple problem, or to illustrate how to build a product using the design process. • 8.2.2.ED.3: Select and use appropriate tools and materials to build a product using the design process.
Limitations (constraints) must be considered when engineering designs.	8.2.2.ED.4: Identify constraints and their role in the engineering design process.

Scope and Sequence
Lesson Activities

Kindergarten: 3 Class Periods
- Students will be able to identify and research a need. Students will focus on recycling and what we can do with reusable items.
- In Google Jamboard, students will sort recyclable materials, trash, and reusable materials.
- Students will then create a fort using the reusable materials. (Sustainable NJ Lesson)

First: 3 Class Periods
- Students will be able to identify and research a need.
- Students will imagine and develop a solution as a class.
- Students create an environmentally friendly robot and design a prototype in Google Draw. (Sustainable NJ Lesson)

Second: 4 Class Periods
- Students will view and discuss two videos from PBS Design Squad: Vacuum Hockey and Making Toys
- Students will brainstorm and discuss how we can build toys or games, using the design process and explore force, the center of gravity, and friction.
- Students will find examples of toys and games that they find appealing, and investigate their design.
- Students will bring one example of a toy or game to discuss in class.
- Students will create a drawing of a toy or game that they would like to design.
- Students will include in their drawing a list of tools and materials that are needed to build their product.
- Drawings will be showcased to the class and classroom discussion will include questions and answers on the product and device.

Interaction of Technology and Humans

Societies influence technological development. Societies are characterized by common elements such as shared values, differentiated roles, and cultural norms, as well as by entities such as community institutions, organizations, and businesses. Interaction of Technology and Humans concerns the ways society drives the improvement and creation of new technologies, and how technologies both serve and change society. (NJDOE)

Core Ideas	Performance Expectations
Human needs and desires determine which new tools are developed.	• 8.2.2.ITH.1: Identify products that are designed to meet human wants or needs. • 8.2.2.ITH.2: Explain the purpose of a product and its value.
Technology has changed the way people live and work. Various tools can improve daily tasks and quality of life.	• 8.2.2.ITH.3: Identify how technology impacts or improves life. • 8.2.2.ITH.4: Identify how various tools reduce work and improve daily tasks. • 8.2.2.ITH.5: Design a solution to a problem affecting the community in a collaborative team and explain the intended impact of the solution.

Scope and Sequence
Lesson Activities

Kindergarten: 2 Class Periods
- Students begin thinking about the influences of technology as they engage in a ThinkPairShare strategy about the computing innovations that have impacted their lives.
- Students will provide examples of how technology makes a difference in their lives.
- Students will describe both the positive and negative impacts of the computing innovation that has had the most impact on their life.

First: 1 Class Period
- Students will watch **The Impact of Technology on Our Lives**
- The class will discuss the technology that we use from the moment we wake up until when we go to sleep at night.
- Students will brainstorm ideas and share how technology impacts and improves our lives. The discussion will include how technology reduces our work and improves simple tasks that we do every day**.**

Second: 3 Class Periods
- Students will watch What is technology? and Top 10 inventions that changed the world.
- The class will have a discussion that will include how we use technology to improve our life.
- Students will then work in groups coming up with a list of problems that we face at school.
- Students will share their ideas and together we will select one problem that is affecting our school and look for solutions to solve the problem.
- Students will work in groups designing a solution to the problem.
- Students will share how technology can or cannot be used to solve the problem. Groups will present their solutions to their classmates.

Nature of Technology

Human population, patterns and movement focus on the size, composition, distribution, and movement of human populations and how they are fundamental and active features on Earth's surface. This includes understanding 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. (NJDOE)

Core Ideas	Performance Expectations
Innovation and the improvement of existing technology involves creative thinking.	• 8.2.2.NT.1: Model and explain how a product works after taking it apart, identifying the relationship of each part, and putting it back together. • 8.2.2.NT.2: Brainstorm how to build a product, improve a designed product, fix a product that has stopped working, or solve a simple problem.

Scope and Sequence
Lesson Activities

Kindergarten: 1 Class Period
- The Gingerbread Man Lesson - MakerSpace Day
  - Students will work in groups to create a bridge that the gingerbread man can use to safely cross the stream using a mystery bag of materials.
  - Students will need to explain how they designed and build their bridge, worked together as a team and fixed any problems that occurred.

First: 1 Class Period
- Goldilocks and The Three Bears Lesson - MakerSpace Day
  - Students will work in groups to design/create a bed for Goldilocks that is just the right size using a mystery bag of materials.
  - Students will need to explain how they designed and built their bed, tested it out, worked together as a team, and fixed any problems that occurred.

Second:
1 Class Period
- The Three Little Pigs Lesson - MakerSpace Day
  - Students will work in groups to design/create a house for the Three Little Pigs that can withstand the huffing and puffing from The Big Bad Wolf using a mystery bag of materials.
  - Students will need to explain how they designed and built their bed, tested it out, worked together as a team, and fixed any problems that occurred.

3 Class Periods
- Carbon Footprints
  - Students ignite prior knowledge about and then use the Park City Green Kid Calculator to view and analyze their carbon footprint.
  - Through discussion and interactive Quizizz activity, students explore each recommendation and its impact. Students may not be able to control how their family fuels their home, but they do have control of some of their actions.
  - Students will consider what environmental choices are theirs to make and which ones are out of their control. The class will then brainstorm techniques for reducing carbon footprints.
  - Each student will choose a personal goal, follow through with it, and then reflect upon his/her experience.
  - Students will create a digital collage with their carbon footprint recommendations and share it with the community. (Sustainable Schools NJ)

Effects of Technology on the Natural World

Many of engineering and technology's impacts on society and the environment are widely regarded as desirable. However, other impacts are regarded as less desirable. Effects of Technology on the Natural World concerns the positive and negative ways that technologies affect the natural world. (NJDOE)	
Core Ideas	**Performance Expectations**
The use of technology developed for the human designed world can affect the environment, including land, water, air, plants, and animals. Technologies that use natural sources can have negative effects on the environment, its quality, and inhabitants. Reusing and recycling materials can save money while preserving natural resources and avoiding damage to the environment.	• 8.2.2.ETW.1: Classify products as resulting from nature or produced as a result of technology. • 8.2.2.ETW.2: Identify the natural resources needed to create a product. • 8.2.2.ETW.3: Describe or model the system used for recycling technology. • 8.2.2.ETW.4: Explain how the disposal of or reusing a product affects the local and global environment.

Scope and Sequence
Lesson Activities

Kindergarten: 2 Class Periods
- Students will be able to identify and research a need.
- Students will focus on recycling and what we can do with reusable items.
- In Google Jamboard, students will sort recyclable materials, trash, and reusable materials.
- Students will then create a fort using the reusable materials. (Sustainable NJ Lesson)

First: 3 Class Periods
- Students will be able to identify and research a need.
- Students will imagine and develop a solution as a class.
- Students will create an environmentally friendly robot and design a prototype in Google Draw. (Sustainable NJ Lesson)

Second: 4 Class Periods
- Students will be asked to consider how they can use compositing to help the environment, analyze the school's current composting plan, and make informed decisions to improve their collective and individual habits with composting.
- Students will participate in a class discussion and watch a video, and create a Google Jamboard to list what can and cannot be composted.
- Students will document and share their knowledge with other grades by designing digital posters advertising what to compost. (Sustainable NJ Lesson)

Ethics & Culture

Ethics and Culture concerns 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. (NJDOE)

Core Ideas	**Performance Expectations**
The availability of technology for essential tasks varies in different parts of the world.	8.2.2.EC.1: Identify and compare technology used in different schools, communities, regions, and parts of the world.

Lesson Activities/Scope and Sequence

Kindergarten:
- NA

First:
- **NA**

Second: 1 Class Period

- Students will watch the Video [What a Classroom Looks like in 27 Countries Around the World](#)
- As a class students will identify and compare technology in schools throughout the world.