Readington Township Public Schools

Grades 3-5 Computer Science

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Readington Township Public Schools

www.readington.k12.nj.us

Computer Science and Design Thinking
Grades 3-5

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	• Unit Tests • Quizzes
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	• 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
Computing devices may be connected to other devices to form a system as a way to extend their capabilities.	8.1.5.CS.1: Model how computing devices connect to other components to form a system.
Software and hardware work together as a system to accomplish tasks (e.g., sending, receiving, processing, and storing units of information).	8.1.5.CS.2: Model how computer software and hardware work together as a system to accomplish tasks.

Shared features allow for common troubleshooting strategies that can be effective for many systems.	8.1.5.CS.3: Identify potential solutions for simple hardware and software problems using common troubleshooting strategies.

Scope and Sequence
Lesson Activities

Third: 3 Class Periods

- Students will watch GCF Global Computer Basics.
  Students will build their own computers out of paper. Hello Ruby: My First Computer
  Students will color, cut out, and label the parts of the hardware.
  Students will review the definitions.

- Students will create and share a Google Slides presentation of a new technology that they would be interested in designing.
- The slideshow will include the name, purpose, features, and benefits of their technology.

Fourth & Fifth:

- See Innovation and Design Curriculum

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
Information needs a physical or wireless path to travel to be sent and received.	8.1.5.NI.1: Develop models that successfully transmit and receive information using both wired and wireless methods.
Distinguishing between public and private information is important for safe and secure online interactions. Information can be protected using various security measures (i.e., physical and digital).	8.1.5.NI.2: Describe physical and digital security measures for protecting sensitive personal information.

Scope and Sequence
Lesson Activities

Third: 2 Class Periods

- The teacher will guide the class through the All About Computer Networks presentation.
- Students will be able to identify
  - What is a computer network?
  - How do they help us?
  - How are nodes on a network connected?
- Students will complete an unplugged Network Classroom Activity and answer reflection questions. (2 class periods)

Fourth & Fifth:

- See Innovation and Design Curriculum

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
The development and modification of computing technology is driven by individual's needs and wants and can affect individuals differently.	• 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.IC.2: Identify possible ways to improve the accessibility and usability of computing technologies to address the diverse needs and wants of users.

Scope and Sequence
Lesson Activities

Third: 4 Class Periods

- Students will explore the World Health Organization website to learn about Assistive products.
- Teams of students will identify a problem that could be solved through a new assistive device or an innovation to an existing invention.
- Students will sketch, draw or build an assistive device to share with their classmates in 4 to 5 minutes digital presentation.
- Students will receive constructive feedback from their peers, work on any redesigns and present their devices to real-life stakeholders.

Fourth & Fifth:

- See Innovation and Design Curriculum

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
Data can be organized, displayed, and presented to highlight relationships.	8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
The type of data being stored affects the storage requirements.	8.1.5.DA.2: Compare the amount of storage space required for different types of data.
Individuals can select, organize, and transform data into different visual representations and communicate insights gained from the data.	• 8.1.5.DA.3: Organize and present collected data visually to communicate insights gained from different views of the data. • 8.1.5.DA.4: Organize and present climate change data visually to highlight relationships or support a claim.
Many factors influence the accuracy of inferences and predictions.	8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, or communicate ideas using data.

Scope and Sequence
Lesson Activities

Third: 1 Class Period

- Students will research 12 or more animals and record their top speeds in Google Sheets.
- Students will organize and present their information in Google Sheets creating a graph that best displays their data.
- Students will be responsible for inputting, organizing, and presenting their data.
- Students will copy, search, retrieve, modify, and delete data in Google Sheets.

Fourth & Fifth:

- See Innovation and Design Curriculum

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
Different algorithms can achieve the same result. Some algorithms are more appropriate for a specific use than others.	8.1.5.AP.1: Compare and refine multiple algorithms for the same task and determine which is the most appropriate.
Programming languages provide variables, which are used to store and modify data.	8.1.5.AP.2: Create programs that use clearly named variables to store and modify data.
A variety of control structures are used to change the flow of program execution (e.g., sequences, events, loops, conditionals).	8.1.5.AP.3: Create programs that include sequences, events, loops, and conditionals.
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.	• 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.
Individuals develop programs using an iterative process involving design, implementation, testing, and review.	8.1.5.AP.6: Develop programs using an iterative process, implement the program design, and test the program to ensure it works as intended.

Scope and Sequence
Lesson Activities

Third: 8 Class Periods

- Students will learn to read, modify and write scripts to change what happens in JavaScript programs.

Fourth & Fifth:

- See Innovation and Design Curriculum

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 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.	• 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.
Engineering design requirements include desired features and limitations that need to be considered.	• 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
Scope and Sequence Lesson Activities	
Third: 2 Class Periods ● Students learn about the engineering design process through class discussions and videos. ● Students will view a PowerPoint that displays how to solve problems in nature. **Fourth & Fifth:** ● See Innovation and Design Curriculum	

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
Societal needs and wants determine which new tools are developed to address real-world problems.	8.2.5.ITH.1: Explain how societal needs and wants influence the development and function of a product and a system.
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.	• 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.ITH.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.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career.
Scope and Sequence Lesson Activities	
Third: 1 Class Period ● The class will discuss the use of Chromebooks and how they have enhanced our classroom experiences. ● Teachers lead a discussion on the purpose of technology in schools, using our Chromebooks responsibly, respectfully, and safely both at home and at school. ● Students will work in groups to create a poster showcasing ways that we use technology to make our lives easier. **Fourth & Fifth:**	

- See Innovation and Design Curriculum

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
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.	• 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.

Scope and Sequence
Lesson Activities

Third:

- NA

Fourth & Fifth:

- See Innovation and Design Curriculum

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 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.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.2: Describe ways that various technologies are used to reduce improper use of resources. • 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved. • 8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment. • 8.2.5.ETW.5: Identify the impact of a specific technology on the environment and determine what can be done to increase positive effects and to reduce any negative effects, such as climate change.

Scope and Sequence
Lesson Activities

Third: 1 Class Period

- Students will explore the use of solar panels at our schools.
- Students will review the data collected and determine the positive and negative effects.

Fourth & Fifth:

- See Innovation and Design Curriculum

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
Technological choices and opportunities vary due to factors such as differences in economic resources, location, and cultural values.	8.2.5.EC.1: Analyze how technology has contributed to or reduced inequities in local and global communities and determine its short- and long-term effects

Scope and Sequence
Lesson Activities

Third:

- NA

Fourth & Fifth:

- See Innovation and Design Curriculum