

SCHOOL DISTRICT OF THE CHATHAMS

Digital Game Design

Grade 8

Marking Period

Course Overview

This course will allow students to explore the basics of computer hardware components and develop computational thinking skills, which will assist students in problem solving through creating game applications in Scratch. Students will follow the Engineering Design process to create aspects of game design such as logic mapping, intuitive user interactions, coding, developer testing, debugging, peer critiquing, user testing, and user feedback. Students will gain proficiency in computational thinking principles while implementing “if else” statements, loops, functions, variables, and operators. The Digital Game Design course will utilize 21st-Century learning skills such as collaboration, communication, and teamwork to create solutions to real world problems.

New Jersey Student Learning Standards

The New Jersey Student Learning Standards (NJSLS) can be located at www.nj.gov/education/cccs/2020/.

Computing Systems

8.1.8.CS.1: Recommend improvements to computing devices in order to improve the ways users interact with the devices.

Algorithms & Programming

8.1.8.AP.1: Design and illustrate algorithms that solve complex problems using flowcharts and/or pseudocode.

8.1.8.AP.2: Create clearly named variables that represent different data types and perform operations on their values.

8.1.8.AP.3: Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.

Engineering Design

8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.

8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem.

8.2.8.ED.5: Explain the need for optimization in a design process.

8.2.8.ED.6: Analyze how trade-offs can impact the design of a product.

Technology Standards

9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

21st Century Integration | NJSLS 9

9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.

Career Ready Practices

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

CRP6. Demonstrate creativity and innovation

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

Interdisciplinary Connections

Science

- MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Units of Study

Unit 1: Introduction to Coding in Scratch (~20 days)

- How has the evolution of computer technology progressed? Identify where you see the future of computer technology going?
- How can a thorough understanding of the nature of a problem, attention to detail, and an understanding of criteria and constraints impact the development and execution of programming code?
- How can coding be applied to simplify a task or automate, process, or solve a problem?
- How can a better understanding of programming logic affect the way a program is written or executed?
- How can the application of operators and variables help simplify and organize a developer's code?
- How can we create a program that keeps a player engaged in the game?

Unit 2: Advanced Coding in Scratch (~20 days)

- How can the application of the Engineering Design Process help us better develop our projects?
- How can the application of functions help simplify and organize a developer's code?
- How can certain programming blocks be used to help condense the amount of code we have to write?

Learning Objectives/Discipline Standards of Practice

Learning Objectives

- Students will be able to create a program that allows Sprites (characters) to move across the screen and interact together in varying circumstances.
- Students will be able to import and design their own Sprites (characters) that show movement using multiple costumes.
- Students will be able to utilize the mathematical coordinate plane in Scratch to choose precise movement points for Sprites (characters).

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- Students will be able to create a program that runs autonomously in Scratch.
- Students will be able to create an interactive game in Scratch.
- Students will be able to incorporate a data variable into an interactive program and manipulate that data variable to provide meaningful outputs when appropriate.
- Students will be able to incorporate a broadcast in a logical manner.
- Students will be able to incorporate 'If Else' and 'Forever' statements when necessary in a program.
- Students will be able to demonstrate that functions, data variables, and broadcasts can be used in a logical manner.
- Create complex programs with multiple working parts.
- Demonstrate the use of the Engineering Design Process.
- Incorporate elements of a good game into a project in a logical manner.
- Troubleshoot complex programming issues.
- Brainstorm a final project that meets various criteria and constraints.
- Create a complex game which utilizes functions, data variables, and broadcasts in a logical manner.
- Create a game that incorporates elements of a good game.
- Create various interactive screens within a game.
- Propose a final project that meets various criteria and project constraints.
- Create a complete game which has a definitive beginning and end.

Discipline Standards of Practice:

- 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.
- 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.
- 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.
- Data & 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.
- 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.
- 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.

- 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.
- 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.
- 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.
- 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.

Instructional Resources and Materials

Whole class resources have been identified with an asterisk.

Resources

- Scratch Programming Software
- Choreograph Programming Software
- *Coding in Scratch: Projects Workbook* [DK Workbook]
- *Computer Coding: An Introduction to Computer Programming* [DK Workbook]
- *Coding in Scratch: Games Workbook* [DK Workbook]
- *Scratch Challenge Workbook* [DK Workbook]
- *Coding Games in Scratch: A Step-by-Step Visual Guide to Building Your Own Computer Games* by Jon Woodcock
- *How to Code in 10 Easy Lessons: Learn How To Design And Code Your Very Own Computer Game* by Sean McManus
- *Code Your Own Games!: 20 Games to Create with Scratch* by Max Wainewright

Materials

- Arduino Hardware & Software
- NAO Robots

Assessment Strategies

Assessment is designed to measure a student's mastery of a course standard and learning objective. Assessment can be used for both instructional purposes (formative assessment) and for evaluative purposes (summative assessment).

Assessment Methods:

- Students will complete approximately five (5) projects between unit 1 and 2.
- When a student completes a project, s/he will complete a checklist, reflect on their work and answer thoughtful questions on their design process.
- A rubric is outlined on the checklist sheet, delineating the project parameters and expectations.

Course Specific Assessments Include:

- An Interactive Commercial / Animation
 - Animation Graded Rubric
- Quiz Game Show
 - Quiz Game Show Graded Rubric
- Amazing Maze / Hungry Caterpillar
 - Amazing Maze Graded Rubric
 - Hungry Caterpillar Graded Rubric
- Classic Arcade Game
 - Classic Arcade Game Graded Rubric
- Final Project
 - Design Your Own Scratch Game Graded Rubric
 - Programming with NAO Graded Rubric
 - Arduino Graded Rubric