Readington Township Public Schools

8th Grade Coding
& App Design (1st year students)

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Readington Township Public Schools
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I. OVERVIEW
Coding is a cycle course for 7th and 8th-grade students. It is designed to expose students to computer science and encourage them to create with technology rather than just consume it. Students will learn and engage in the strategies of computational thinking throughout the course which include decomposition, pattern matching, abstraction, and algorithms. In 7th grade, students will also learn how to write programs for various types of games and will create their own game with knowledge gained throughout the course. In 8th grade, students will learn how to write code to design apps and will design their own app using knowledge gained in this course.

II. STUDENT OUTCOMES (Linked to ISTE Standards - International Society for Technology in Education)
The course objectives will cover but are not limited to these standards:
1. Empowered Learner: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
   1b. Students build networks and customize their learning environments in ways that support the learning process.
   1c. Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.
   1d. Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.
2. Digital Citizen: Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.
   2a. Students cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world.
   2b. Students engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices.
   2c. Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.
   2d. Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online.
4. Innovative Designer: Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.

   4a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
   4c. Students develop, test and refine prototypes as part of a cyclical design process.
   4d. Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.
5. Computational Thinker: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

   5a. Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
   5c. Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
   5d. Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.
6. Creative Communicator: Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.

   6a. Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.

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    6b. Students create original works or responsibly repurpose or remix digital resources into new creations

    6d. Students publish or present content that customizes the message and medium for their intended audiences.

  7. Global Collaborator: Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.

    7b. Students use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints.

    7c. Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.

Standards for Mathematical Practice

  MP1 Make sense of problems and perseverance in solving them
  MP2 Reason abstractly and quantitatively
  MP3 Construct viable arguments and critique the reasoning of others
  MP4 Model with mathematics
  MP5 Use appropriate tools strategically
  MP6 Attend to precision
  MP7 Look for and make use of structure
  MP8 Look for an express regularity in repeated reasoning

III. COURSE OBJECTIVES

Foundations of Coding

- Introduction

  Students will be able to:
  - Order movement commands as sequential steps in a program
  - Modify an existing program to solve errors
  - Break down a long sequence of instructions into the largest repeatable sequence

- Events

  Students will be able to:
  - Identify actions that correlate to input events
  - Create an interactive game using sequence and event-handlers
  - Share a creative artifact with other students

- Loops

  Students will be able to:
  - Break complex tasks into smaller repeatable sections
  - Recognize large repeated patterns as made from smaller repeated patterns
  - Identify the benefits of using a loop structure instead of manual repetition
  - Distinguish between loops that repeat a fixed number of times and loops that repeat as long as a condition is true
  - Use a while loop to create programs that can solve problems with unknown values

- Debugging Programs

  Students will be able to:
  - Read and comprehend given code
  - Identify a bug and the problems it causes in a program
  - Describe and implement a plan to debug a program

- Conditionals

  Students will be able to:
  - Translate spoken language conditional statements and loops into a program
  - Solve puzzles using a combination of looped sequences and conditionals
  - Build programs with the understanding of multiple strategies to implement conditionals

- o   Nest conditionals to analyze multiple value conditions using if, else if, else logic
- o   Pair a loop and conditional statement together
- Binary
Students will be able to:
  - o   Identify methods for encoding images into binary
  - o   Relate images to a peer using binary encoding
  - o   Reproduce an image, based on binary code
  - o   Match binary sequences to encoded images
  - o   Utilize loops and binary code to recreate provided images
  - o   Create pictures using unique combinations of on and off
  - o   Learn to count in binary
  - o   Identify letters in binary code

Digital Citizenship

- Digital Footprint and Privacy & Security:
Students will be able to:
  - o   learn that they have a digital footprint and that information from it can be searched; copied and passed on; seen by a large, invisible audience, and can be persistent
  - o   recognize that people's online information can be helpful or harmful to their reputation and image
  - o   consider their own digital footprints and what they want those footprints to be like in the future

Design and Concept Development

- Students will be able to understand and utilize the steps in an engineering design process (similar to the one below) :
  - o   Ask: Identify the Need and Constraints
  - o   Research the Problem
  - o   Imagine: Develop Possible Solutions
  - o   Plan: Select a Promising Solution
  - o   Create: Build a Prototype
  - o   Test and Evaluate Prototype
  - o   Improve: Redesign as Needed
- Students will be able to learn to plan in advance for an ongoing assignment
- Students will be able to explain how system limitations can affect project design
- Students will be able to describe how compromise can help keep a project on track and inspire creativity
- Students will be able to design and produce their own app using all information learned in this course
- Students will be able to develop several apps
  - o   These apps may include but not limited to:
    - ▪   Talk to Me
    - ▪   Virtual Pet
    - ▪   Magic 8 Ball
    - ▪   Ball Bounce/Pong
    - ▪   Create your own Adventure
    - ▪   Paint Pot/FInger Painting
    - ▪   Mash the Mole/Ladybug

IV. STRATEGIES
- Group discussions
- Teacher presentation
- Student projects
- Guided groups
- One to one instruction
- Interactive SmartBoard lessons
- Tutorials
- Online practice
- Logbooks

V. EVALUATION
Assessments may include but are not limited to:
- Teacher Observations
- Class Participation
- Class Discussions
- Class Assignments
- Homework Assignments
- Notebooks/Logbooks
- Student Projects
- Tests and Quizzes
- Anecdotal Records
- Presentations

VI. REQUIRED RESOURCES
- Code Studio Lessons
- MIT App Lab
- MIT App Companion
- Common Sense Media
- Laptops/Chromebooks
- Tablets
- Headphones
- Design Journals
- Pocket Folders

Supplemental Resources may include, but are not limited to:
- Code Monkey Island
- Code Master
- Makey Makey Classic
- Ozobots

VII. SCOPE AND SEQUENCE
Additional time will be spent on reviewing concepts that may need to be revisited.

Foundations of Coding (20 days)
- Intro
- Events
- Loops
- Debugging Process

- Conditionals
- Binary

Digital Citizenship (5 days)
- Digital Footprint
- Privacy and Security
- Career Focus: Technology in Different Fields

Design and Concept Development (20 days)
- Design Process
- Coding in MIT App Lab
- Explore various app types
- Design and Produce Apps