Grade 6 STEM Unit 3: Coding

Content Area: **STEM**
Course(s): **STEM Grade 6**
Time Period: **MP1**
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8.1.8.CS.4	Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems.
8.1.8.AP.3	Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.
8.1.8.AP.7	Design programs, incorporating existing code, media, and libraries, and give attribution.
8.1.8.AP.9	Document programs in order to make them easier to follow, test, and debug.
5-PS3-1	Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.
5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water.
5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
K-ESS3-3	Communicate solutions that will reduce the impact of climate change and humans on the land, water, air, and/or other living things in the local environment.
3-LS4-3	Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
3-LS4-4	Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
4-ESS3-1	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Science and Engineering Practices

Engaging in Argument from Evidence

Construct an argument with evidence. (3-LS4-3)

Support an argument with evidence, data, or a model. (5-LS1-1)

Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-LS4-4)

Developing and Using Models

Use models to describe phenomena. (5-PS3-1), (5-LS2-1)

Obtaining, Evaluating, and Communicating Information

Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)

Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)

Disciplinary Core Ideas

ESS3.A: Natural Resources

Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)

ESS3.C: Human Impacts on Earth Systems

Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3-3)

LS1.C: Organization for Matter and Energy Flow in Organisms

Plants acquire their material for growth chiefly from air and water. (5-LS1-1)

LS2.A: Interdependent Relationships in Ecosystems

The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid)

back into the environment. (5-LS2-1)

LS4.C: Adaptation

For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)

LS4.D: Biodiversity and Humans

Populations live in a variety of habitats and change in those habitats affects the organisms living there. (3-LS4-4)

PS3.D: Energy in Chemical Processes and Everyday Life

The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1)

Crosscutting Concepts

Cause and Effect

Cause and effect relationships are routinely identified and used to explain change. (3-LS4-3), (4-ESS3-1)

Events have causes that generate observable patterns. (K-ESS3-3)

Systems and System Models

A system can be described in terms of its components and their interactions. (3-LS4-4)

Interdependence of Science, Engineering, and Technology

Knowledge of relevant scientific concepts and research findings is important in engineering. (3-LS4-4), (4-ESS3-1)

Energy and Matter

Energy can be transferred in various ways and between objects. (5-PS3-1)

Matter is transported into, out of, and within systems. (5-LS1-1)

Influence of Science, Engineering and Technology on Society and the Natural World

Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)

Systems and System Models

A system can be described in terms of its components and their interactions. (5-LS2-1)

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Science explanations describe the mechanisms for natural events. (5-LS2-1)

Rationale and Transfer Goals

Teaching coding in middle school provides students with valuable skills such as problem-solving, logical thinking, and creativity. It also introduces them to technology, an essential aspect of our world. Coding promotes computational thinking and can lead to future career opportunities in technology-related fields. Additionally, it fosters teamwork, as coding often involves collaboration on projects, enhancing communication skills. Overall, learning coding early equips students with tools to navigate the digital age effectively.

Enduring Understandings

Algorithmic Thinking: Students should understand that coding involves breaking down tasks into smaller steps (algorithms) to solve problems efficiently and logically.

Programming Logic: Students should grasp the concept of conditional statements, loops, and variables, which are fundamental to creating functional programs and applications.

Problem-Solving Skills: Students should learn that coding is a powerful tool for solving real-world problems and that different coding solutions can be applied to various scenarios.

Debugging and Persistence: Students should understand that debugging is a natural part of coding and that persistence and troubleshooting are essential skills in identifying and rectifying errors.

Essential Questions

How does coding contribute to solving real-world problems and improving daily life?

What are the fundamental concepts and principles underlying coding languages and algorithms?

How does computational thinking help break down complex problems into smaller, manageable components?

How does debugging and troubleshooting contribute to the development of coding skills and problem-solving abilities?

How can the skills acquired through coding education be transferable to other areas of learning and future career opportunities?

Content - What will students know?

- Beginner coding techniques
- Complex problem identification
- Brainstorming and Problem Solving

Skills - What will students be able to do?

- Define Coding
- Develop code
- Create an interactive animation using behaviors in computer science.
- Develop models of for a presentation

Activities - How will we teach the content and skills?

- Coding Intro Activity
- Coding Angry Birds
- Marine Ecosystem Simulation Code.org activity

Evidence/Assessments - How will we know what students have learned?

- Question and answer worksheet accompanying google slides Pre/post quiz
- Final Code.org assignment for Angry Birds
- Final presentation for Marine Ecosystem Simulation

Spiraling for Mastery

Content or Skill for this Unit	Spiral Focus from Previous Unit	Instructional Activity
Coding and Programming	Engineering design process and problem-solving.	Students will be reintroduced to the concepts of coding and programming through an introductory activity in Code.org

Key Resources

www.code.org

21st Century Life and Careers

9.2.8.CAP.12	Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

Career Readiness, Life Literacies, & Key Skills

9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

Interdisciplinary Connections/Companion Standards

NJSLS ELA

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS4-3), (3-LS4-4)

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-3), (3-LS4-4)

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS4-3), (3-LS4-4)

W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS4-3), (3-LS4-4)

W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS4-3), (3-LS4-4)

SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS4-3), (3-LS4-4)

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an

answer to a question quickly or to solve a problem efficiently. (5-PS3-1)

SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-PS3-1), (5-LS2-1)

W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS3- 3)

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS3-1)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS3-1)

W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS3-1)

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-LS1-1)

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-LS1-1)

W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-LS1-1)

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-LS2-1)

NJSLS Mathematics

MP.2 Reason abstractly and quantitatively. (3-LS4-3), (3-LS4-4), (4-ESS3-1), (5-LS1-1), (5-LS2-1)

MP.4 Model with mathematics. (3-LS4-3), (3-LS4-4),(4-ESS3-1), (5-LS1-1), (5-LS2-1)

MP.5 Use appropriate tools strategically. (5-LS1-1)

3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. (3-LS4-3)

4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-1)

5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. (5-LS1-1)