Grade 5 STEAM - Unit 1 - Coding + Robotics

Unit Focus

In the first unit for fifth grade, the students will begin learning the basics of block coding through the use of a Sphero robot and the corresponding Sphero EDU app. The students will learn how to use block coding to perform tasks with increasing complexity throughout the learning activities. The activities will be guided by the facilitator as the students learn how to use the different blocks to perform the given task. The essential materials needed, as previously stated, are the Sphero robot and the Sphero EDU app. The unit will culminate with the students collaborating on an original game program that is either new, an iteration of a previous game, or a refactoring of a game created during the unit.

Stage 1: Desired Results - Key Understandings

Standard(s)

Standards

- Common Core
  - *Mathematics: 5*
    - Classify two-dimensional figures into categories based on their properties.
    - Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles. *(CCSS.MATH.CONTENT.5.G.B.3)*
    - Classify two-dimensional figures in a hierarchy based on properties. *(CCSS.MATH.CONTENT.5.G.B.4)*
    - Mathematical Practices
    - Make sense of problems and persevere in solving them. *(CCSS.MATH.MP.1)*
    - Construct viable arguments and critique the reasoning of others. *(CCSS.MATH.MP.3)*
    - Attend to precision. *(CCSS.MATH.MP.6)*
- CSTA: Computer Science Standards (2017-)
  - *CSTA: 3-5*
    - Algorithms & Programming *(1B-AP)*
    - Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. *(1B-AP-11)*
    - Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features. *(1B-AP-12)*

Transfer

Students will be able to independently use their learning to...

T1 Exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

Meaning

Understanding(s)	Essential Question(s)
Students will understand that... **U1** Collaboration with others can improve product creation by incorporating different perspectives in the final design. **U2** Programmers debug and revise their programs to improve the stability of the program. **U3** Complex problems can more easily be solved by breaking them down in smaller components and solving for those. **U4** Gravity is the force exerted between two objects, drawing them together. Friction is the resistance of one object in relation to another when they have contact.	*Students will keep considering...* **Q1** Based on current information, how do I develop a testable design? 3-12 **Q2** Based on what I am seeing, how does it shape my thinking? **Q3** What is the most efficient way to solve this problem? **Q4** Why would friction affect the program you write for your robot?

Acquisition of Knowledge and Skill

Knowledge	Skill(s)
Students will know... **K1** Using loops allows a programmer to nest code. **K2** Refactoring is creating another iteration of your code that delivers the same output, only with less blocks.	*Students will be skilled at...* **S1** Using block coding to create a solution to a problem. **S2** Using blocks that contain a loop, conditional, and/or variable.

Stage 1: Desired Results - Key Understandings

▪ Use an iterative process to plan the development of a program by including others' perspectives and considering user preferences. *(1B-AP-13)* ▪ Test and debug (identify and fix errors) a program or algorithm to ensure it runs as *(1B-AP-15)* ▪ Describe choices made during program development using code comments, presentations, and demonstrations. *(1B-AP-17)* • National Core Arts Standards ○ *Visual Arts: 5* ▪ Investigate, Plan, Make: Generate and conceptualize artistic ideas and work. *(VA:Cr1.1.5)* ▪ Combine ideas to generate an innovative idea for art-making. *(VA:Cr1.1.5.a)* ▪ Investigate: Organize and develop artistic ideas and work. *(VA:Cr2.1.5)* ▪ Experiment and develop skills in multiple art-making techniques and approaches through practice. *(VA:Cr2.1.5.a)* ▪ Demonstrate quality craftsmanship through care for and use of materials, tools, and equipment. *(VA:Cr2.2.5.a)* • Next Generation Science Standards (content standards) ○ *Elementary Standards: 5* ▪ Motion and Stability: Forces and Interactions *(5-PS2)* ▪ Support an argument that the gravitational force exerted by Earth on objects is directed down. *(5-PS2-1)* ▪ Engineering Design *(3-5-ETS1)* ▪ Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. *(3-5-ETS1-1)* ▪ Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. *(3-5-ETS1-2)* ▪ Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. *(3-5-ETS1-3)* • Next Generation Science Standards (DCI) ○ *Science: 5* ▪ ENGINEERING, TECHNOLOGY & APPLICATIONS OF SCIENCE ▪ Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution	**K3** Conditional blocks allow you to evaluate if a condition is true before calling the logic within the blocks. **K4** A comparator compares two values and then calls conditional logic if the comparison is true. **K5** Functions are useful to call code into your program. **K6** Variables allow a programmer to change things in the code while it is being executed. **K7** Friction is a force that is applied to Bolt that can affect your program.	**S3** Refactoring basic code to use fewer blocks. **S4** Writing their own simple program using block code.

Stage 1: Desired Results - Key Understandings

(criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. *(ETS1.5.A1)* ▪ Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. *(ETS1.5.B1)* ▪ At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. *(ETS1.5.B2)* ▪ Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. *(ETS1.5.B3)* ▪ Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. *(ETS1.5.C1)* ▪ PHYSICAL SCIENCES ▪ The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. *(PS2.5.B1)* **Madison Public Schools Profile of a Graduate** o Design: Engaging in a process to refine a product for an intended audience and purpose. *(POG.2.2)* o Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. *(POG.3.1)*		