Coding Dice	Grade 3: Forces Causing Movement

Lesson Plan

Coding Tool	Offline coding
Cross-curricular	• Coding • Forces

Big Ideas

- There are several types of forces that cause movement.
- Forces cause objects to speed up, slow down, or change direction through direct contact or through interaction at a distance.
- Forces in nature, such as high winds or water, can have a significant impact on humans and the environment, and need to be regarded with respect.

Overall Expectations

2. investigate devices that use forces to create controlled movement;
3. demonstrate an understanding of how forces cause movement and changes in movement

Specific Expectations

2.2 investigate forces that cause an object to start moving, stop moving, or change direction
2.5 use appropriate science and technology vocabulary, including push, pull, load, distance, and speed, in oral and written communication
3.1 identify a force as a push or a pull that causes an object to move
3.2 identify different kinds of forces

Description

This lesson combines concepts in coding and forces to teach students about conditional statements as well as key vocabulary terms related to forces. This is done by playing a game that gives them choices based on rolls of a dice.

Materials

- Dice (2 per student)
- Handout
- Pencil
- Token (coin, eraser, small toy car, etc.)

Computational Thinking Skills

- Condition statement
- If Then statement
- Algorithm
- Pseudo code

Introduction

The key coding concept in this lesson is related to conditional statements. A conditional statement is code that causes an action when a condition is met. In this case, the conditional statement is an IF THEN statement. Students will see how an IF THEN statement is used by rolling the dice and applying different vocabulary terms.

The vocabulary terms in this activity are related to forces and are as follows:

- **Pull**: a force exerted on someone or something to cause movement toward oneself

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- **Push**: a force exerted on someone or something to move them away from oneself or the origin of the force.
- **Change Position**: a displacement with respect to time
- **Speed**: the rate at which someone or something is able to move
- **Friction**: the force that resists relative motion between two bodies in contact
- **Repel**: a force that causes objects to back away or separate
- **Attract**: a force that causes objects to come together
- **Gravity**: a force of attraction that exists between any two masses/bodies/particles
- **Magnetism**: an attraction or repulsion that occurs between electrically charged particles because of their motion

Action

Prior to playing the game, it could be beneficial to discuss the forces with students. Once that is complete, here is how to play:
- Each student starts with a game board (handout), a token and 2 dice.
- To start the game, place your token on the START square.
- The goal of the game is to get to the FINISH square.
- The objective of the game is to follow the IF THEN statements correctly. Getting to the FINISH square will depend on the rolls of the dice and the decisions made.
- Like a computer, students must follow the instructions precisely.
- With each roll of the die, there is an action in order to move the token.
- Roll the die and refer to the handout for predetermined movement.
- Each movement is associated with different forces and specific directions.
- **Note:** Students can't land on a colored box unless indicated by a specific condition

Consolidation/Extension

Students can play this game individually by keeping track of the number of turns, or by playing against one another.

Assessment

Use the post-activity handout to assess students' comprehension of IF THEN statements. With this handout, students are tasked with creating their own statements that correspond with the roll of a dice. For example, students could make conditions for dance choreography in which each number is associated with a dance move.

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