Bulldozer Bonanza with Dash

Objective:

- Teach students the engineering design process through a hands-on robotics activity.
- Develop problem-solving, teamwork, and iterative design skills.
- Introduce basic principles of robotics and coding.

Standards:

- CSTA 1A-AP-10: Develop programs with sequences and simple loops to express ideas or address a problem.
- NGSS 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- NGSS 3-5-ETS1-2: 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.

Materials Needed:

- Dash robots
- Lego attachments for Dash
- Unifix cubes
- Dividers for sectioning off areas
- Tape for marking starting points and target squares
- Coding devices (tablets or computers)

Setup:

1. Section off areas within the room using dividers.
2. Spread unifix cubes on the floor within each section.
3. Mark a starting point and a target square in each section using tape.

Procedure:

1. **Introduction (5 minutes):**
   - Explain the objective of the activity and the basic controls of the Dash robot.

- ○ Introduce the engineering design process: Ask, Imagine, Plan, Create, Test, and Improve.
2. **Planning Phase (10 minutes):**
   - ○ Allow students to brainstorm and sketch their bulldozer blade designs.
   - ○ Discuss how the design might impact the robot's ability to gather unifix cubes.
3. **Building Phase (15 minutes):**
   - ○ Students build their bulldozer blades using Lego attachments.
   - ○ Ensure each team has a complete attachment before testing.
4. **Testing and Adjusting Phase (20 minutes):**
   - ○ Students test their designs by attempting to gather unifix cubes into the target square.
   - ○ Allow time for adjustments between rounds, encouraging iterative improvement.
   - ○ Ensure each student gets a turn to control the robot, either by coding or using the drive option.
5. **Competition or Free Play (20 minutes):**
   - ○ Conduct a timed competition or allow free play where students work at their own pace.
   - ○ Emphasize taking turns and teamwork.
6. **Review and Feedback (10 minutes):**
   - ○ Gather students for a discussion about their designs and strategies.
   - ○ Provide feedback and discuss the challenges faced and solutions found.

Guiding Questions:

- How did your initial design perform? What changes did you make to improve it?
- What challenges did you face while designing the bulldozer blade?
- How did teamwork and communication impact your design process?
- Which coding method (blocks or drive) did you prefer and why?

Conclusions:

- Students should understand the engineering design process and its application in real-world problem-solving.
- Highlight the importance of iteration and testing in designing functional solutions.
- Encourage reflection on the role of teamwork and effective communication in successful engineering projects.