Research and Planning for Engineering in the Primary Grades

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Big Concepts in Primary Engineering Design Challenge

The "big concepts" to be covered in this design challenge include the idea that our world consists of forces that are constantly at work, pushing and pulling everything around us. Students will work through this challenge to discover how they can manipulate these forces to make an object move in the desired direction. Students will explore concepts of engineering design, physical science, and cooperative learning.

Standards

The standards students are working to meet include those from the Next Generation Science Standards (NGSS) and the Next Generation Science Standards for Engineering Practice. These standards are listed below:

- NGSS K-PS2-1- Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
- NGSS Science and Engineering Practice 6- Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.

Declarative and Procedural Knowledge Needed

To be able to complete this design challenge, my students will need to have some declarative and procedural knowledge. The declarative knowledge that students must have is the idea that things can be moved from one point to another and that objects cannot change direction on their own. The procedural knowledge the students must also know that something has to make an object move. These pieces of information will be crucial to the design process because, without them, students will be unable to complete the challenge of not only making an object move but be able to change its direction.

Objectives and Ancillary Concepts

While completing this design challenge, students will be able to explore how pushes can have different strengths and directions and that pushing on an object can change the speed or direction of its motion and can start or stop it. Students will also be able to explore the idea that when objects touch or collide, they push on one another and can change motion. These objectives are a part of the Next Generation Science Standards, PS2.A and PS2.B, respectively.

Possible Activities

There are a variety of possible activities that students may be able to participate in to be able to complete this design challenge. One possible activity is a 5E lesson developed by my district. In this challenge, students design a way to get a ball from one place to another while changing directions at least two times, making a ball complete a maze, or making a ball knock another object down after changing direction at least one time.

A second possibility comes from a lesson posted to a forum in another course. This activity uses toy cars and asks students to investigate different strength pushes that would cause collisions for the two cars.

Best Activity for My Classroom

I feel as though the best activity for my classroom may be the one that uses toy cars to investigate pushes. The toy cars are a more authentic way for my students to be able to apply the knowledge they already know to this investigation. All of my students have played with toy cars in or out of my classroom and love to crash them. This investigation will take that love to the next level as it challenges them to find a way to make the cars move without physically pushing them.