



Designing an amusement park ride

Students generally fully engage with science, technology, engineering, and mathematics (STEM) activities because they get to creatively explore problem solving within a context that makes sense to them. STEM activities afford an opportunity to explore interrelated curriculum in an exciting, appealing way that is often motivating (Roehrig et al. 2012). Such activities support student development of ideas and concepts focused on meaning and understanding (Prince 2004). Exploring STEM activities is undoubtedly important for elementary school children, but teachers must also have the opportunity to learn STEM curriculum so that they can better create and teach integrated curriculum.

To improve access to STEM curriculum, an activity was planned that presents the opportunity to design and build using gears and other tools. In this challenge, preservice elementary school teachers were asked to mathematically analyze gears and create an amusement park ride that uses gears to spin. Although this lesson was implemented with preservice teachers, it was designed to embed elementary school curriculum within the context of learning content. Not enough current opportunities exist for elementary school teachers to learn about and from STEM activities to help support the STEM engagement of their students in the future (DeJarnette 2012). The Amusement Park Ride challenge offers the chance to explore STEM within the context of future curriculum that elementary school teachers may teach. The lesson can easily be explored with students in intermediate elementary grades as well.

The challenge

Two major components make up the challenge; the first focuses on the mathematics of the

lesson in relation to the gears; the second component focuses on the construction of the ride (for lesson instructions, see the online appendix). The challenge was presented (1) within a context, (2) with multiple entry points, and (3) having several methods of solution. All three are key elements of STEM activities (Berland 2013). At the time, the preservice teachers were studying the multiplicative structure of numbers.

Each group of three or four preservice teachers received its own Polydron® Revolution Set 2. This kit is available from multiple educational sites (found through a simple Web search). To support their development of STEM within a context, the teachers were to create an amusement park ride with specific requirements.

Embedded mathematics concepts

The gears were analyzed in relation to their rotation, aligning with several mathematical concepts. The gears in the kit have the number of teeth as follows:

- Small gear—8 teeth
- Medium gear—16 teeth
- Large gear—24 teeth.

A preservice teacher stated the following:

The small gear equals three rotations, and the large gear equals one rotation. We marked each wheel [gear] and then rotated them until they met up again. We counted the rotations . . . Because each gear's teeth is a multiple of eight, it reflects the number of rotations it takes for the gears to meet up at their starting point.

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