

*Elementary Engineering Curriculum
Amusement Park Ride Challenge*

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Grade: 2

Stage 1- Desired Results

<p>Understandings: Students will understand that ...</p> <p>Rides (and other transportation machines) must be safe and fun.</p> <p>Engineering design is a challenging and creative iterative process.</p>	<p>Essential Questions:</p> <p>Can you design and build a great amusement park ride using your Lego WeDo robot kit?</p> <p>What is it like to be an engineer who designs and builds fun products for people to use?</p>
<p>Student will know ...</p> <p>Electrical energy is transformed to mechanical energy by a motor.</p> <p>There are different ways to transfer energy in a mechanical system from a motor to mechanical parts via direct drive, gears, pulleys, belts, and cams.</p> <p>People design ads to attract other people to a product or service.</p> <p>Engineers need to consider the safety of products.</p>	<p>Student will be able to...</p> <p>Design a prototype.</p> <p>Test a prototype and make adjustments as needed.</p> <p>Build and program an amusement park ride of their own creation using Lego WeDo kits.</p> <p>Create a poster to advertise their creation.</p> <p>Diagram and label the major parts of their design.</p>

Stage 2- Assessment Evidence

<p>Performance Tasks: Observation and Final Poster Formative: Performance: Authentic Task Teacher observes students working in their group. Are they working through problems? Are they using simple machines in their design? Is the ride safe? Is the ride interesting? Does their ad poster do a good job showing off the best features of their design? Does the poster show the major parts and drive train of their robot?</p>	<p>Other Evidence: The optional reflection paper offers another way of assessment. There are process questions and a content question that asks for their understanding of how energy is transferred in their ride.</p>
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Self-Assessments	Other Evidence, Summarized

Stage 3 Learning Plan

Learning Activities:

Go over the directions with the students (shown next), who are paired in teams of 2. Make sure they draw or write at least a few ideas before they start to build.

Design an exciting, interesting, and safe amusement park ride using your LEGO WeDo Robot kit and your computer. The ride must use a motor.

With your partner, talk about a design and draw a picture and/or use words to describe your idea. Make sure you can actually build your idea using your WeDo kit.

People should be able to get on and off safely.

The ride should be fun and interesting. You can use the computer to change speeds, make sounds, and change directions.

If you have time, add a sensor to start your ride automatically.

After you finish make a poster for your ride using words and pictures. Have students diagram their ride using words for the parts including power cord, gears, pulleys, motors, and other important parts. Show the normal direction of motion of each gear or pulley.

Here are some tips for this project.

- Design – most second graders tend to design rides that cannot be built. However, this is a good introduction to the design process and the idea of planning ahead as a start. They will quickly modify their ideas as they build.
- Programming – you can require that this ride have a finite time like a real ride. You can also encourage students to start and end slowly. They can also program their own sound, which becomes sound number 1, to be a typical ride announcement they might hear in an amusement park. You may want to keep track of which team has which computer and/or save their programs with their names as the filename.
- Mistakes – watch for student frustration and encourage and support their efforts through failures and redesigns. It’s all part of the creative engineering process.

- Teamwork – monitor teamwork. Make sure both students have a job. Encourage both students to build and program.
- Building – students may need support building stable design. They may need help understanding that large structure need stable bases. If designs are wobbly, encourage them to try a more symmetrical design.
- Scaffolding – be careful of giving too much help. On the other hand, use your judgment in giving selected scaffolding to move them forward and avoid excessive frustration.
- Posters – requiring the students to diagram their design, labeling the key parts is a good way to share out their engineering work and science knowledge. We have students do a rough draft and then a final poster in color. We have each student design his or her own poster.
- Fair - a fair is a great way to share out their work. Students, parents, and staff come and listen to the sales pitches and view the rides and posters. Having younger students come in builds excitement for the future.

Time Required

4x 50-minute blocks, one additional day may be needed or additional poster time.

Day 1 – Directions, Designing, and Building

Day 2 – Go over programming, continue building, programming

Day 3 – Finish building and programming, work on posters.

Day 4 – Final touches, then fair during second half of class.

Extensions/Modifications

Children with autism may need to work alone or with close adult support.

Materials

- Lego Education WeDo Robotics Kits
- Laptops with WeDo software
- Paper and markers for designs
- Design worksheet/checklist
- Reflection paper