Rotary Motion

v3.0

Mechanisms & Movement | Teacher Lesson Plan

Overview:

In this lesson, students will learn how to create rotary motion using Kid Spark engineering materials. Students will build a simple gear train and observe how it creates rotary motion. Then, students will work as a team to create a custom design that produces rotary motion.

Click here **to explore the entire Kid Spark Curriculum Library.**

Learning Objectives & NGSS Alignment:

- Define rotary motion.
- Build a gear train and observe how it creates rotary motion.
- Create a custom design that produces rotary motion.

Scientific/Engineering Practice - Asking questions & defining problems
Crosscutting Concept - Cause & effect; mechanism & explanation

Pre-Lesson Preparation:

1. Prepare enough lesson materials for each team. (Curriculum Packets, Student Engineering Workbooks)
2. Become familiar with the concept of rotary motion. *Curriculum Packet - Pages 1 - 2*
3. Prepare an example solution for the Design and Engineering Challenge. *Curriculum Packet - Page 7*

Activity Time:

120 Minutes

Note: This lesson can easily be taught over the course of two class periods.

Period 1 - Convergent Learning Activity
Period 2 - Divergent Learning Activity

Targeted Grade Level:

2 - 5

Student Grouping:

Teams of up to 4 students

Additional Lesson Materials:

- Curriculum Packet
- Student Engineering Workbook

Kid Spark STEM Lab:

STEM Pathways **or**
Engineering Pathways (w/Spark:bit)

Convergent Learning Activity:

1. Introduce students to the concept of rotary motion. Discuss some real-world examples of rotary motion (wheels on a car, a ceiling fan, etc..). Then, explore how different Kid Spark engineering materials can be used to create rotary motion. *Curriculum Packet - Pages 1 - 2*
2. Instruct teams to assemble a simple gear train. *Curriculum Packet - Pages 3 - 5*
3. Work with teams as they observe the rotary motion produced by the gear train. Point out how the gears are rotating in opposite directions. *Curriculum Packet - Page 6*
4. Discuss how the arrangement of the small and large gears determine if the gear train will increase torque or speed. *Curriculum Packet - Page 6*

   To increase torque (a twisting force that causes rotation) using a gear train, a motor module should be directly connected to a small gear and used to drive a large gear.

   To increase speed using a gear train, a motor module should be directly connected to a large gear and used to drive a small gear.
5. Instruct teams to rearrange the gear train so the large gear is connected to the motor module and the small gear is connected to the bearing module. *Note: This arrangement increases the output speed of the gear train.* *Curriculum Packet - Page 6*

Divergent Learning Activity:

1. Review the Design & Engineering Challenge with teams. *Curriculum Packet - Page 7*
2. Instruct teams to use the Kid Spark Design & Engineering Process to develop a solution to the challenge. *Student Engineering Workbook - Page 3*
3. Instruct teams to fill out the design specification after they have completed their project. *Student Engineering Workbook - Page 4*
4. Review the challenge rubric with teams so they understand how they will be evaluated for the project. *Student Engineering Workbook - Page 5*
5. Consider setting strict time boundaries for the divergent learning activity (see example below). Keep in mind that teams won't always complete a design that works or looks as intended. That's alright! Students can learn a lot by reflecting on their experience and considering what they might have done differently if they had more time or could start the project over.

    a. Review the challenge with teams. (2 minutes)

    b. Teams work through the Design and Engineering Process to create a design. (30 minutes)

    c. Teams complete design specification. (10 minutes)

    d. Teams present designs to class. Each team has 1 minute max to present. (10 minutes)

    e. Lab cleanup. (8 minutes)

Lesson Closure:

1. Project presentations - Instruct each team to share the design they created with the rest of the class.
2. Lab cleanup - After teams have finished their presentations, instruct them to disassemble their designs and pack all engineering materials back into the labs correctly by referring to the Inventory and Organization Guide.
3. Lesson reflection - If time permits, do a quick recap/review of the lesson.

Assessment/Evaluation:

A. Student Engineering Workbook (7 Points)

B. Design & Engineering Challenge (25 Points)