

## **2.B.2 Ramps/Motion**

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### *Investigating motion using the Engineering Design Process*

<b>Grade Level</b>	2
<b>Sessions</b>	1 - 50 minutes
<b>Seasonality</b>	None
<b>Instructional Mode(s)</b>	Small Groups
<b>Team Size</b>	3-4 students
<b>WPS Benchmarks</b>	02.SC.TE.03; 02.SC.TE.04; 02.SC.IS.01; 02.SC.IS.02; 02.SC.IS.03; 02.SC.IS.04; 02.SC.IS.05; 02.SC.IS.06;
<b>MA Frameworks</b>	K-2.TE.1.3; K-2.TE.2.1
<b>Key Words</b>	Structure, Build, Shelter, Engineering Design Process

### **Summary**

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This lesson introduces children to the idea of “motion” as well as a basic version of Newton’s Laws. Students are allowed to explore motion through creating a simple track system to overcome several obstacles. Additional objectives include the strengthening of teamwork and manipulative skills, and the provision of a context in which students use the Engineering Design Process.

### **Learning Objectives**

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#### *2002 Worcester Public Schools (WPS) Benchmarks for Grade 2*

1. **02.SC.IS.01** Ask questions about objects, organisms, and events in the environment.
2. **02.SC.IS.02** Tell about why and what would happen if?
3. **02.SC.IS.03** Make predictions based on observed patterns.
4. **02.SC.IS.04** Name and use simple equipment and tools to gather data and extend the senses.
5. **02.SC.IS.05** Record observations and data with pictures, numbers, or written statements.
6. **02.SC.IS.06** Discuss observation with others.
7. **02.SC.TE.03** Identify and describe the safe and proper use of tools and materials (e.g. glue, scissors, tape, ruler, paper, toothpicks, straws, spools) to construct simple structure.

8. **02.SC.TE.04** Identify tools and simple machines used for a specific purpose, e.g., ramp, wheel, pulley, lever.

### **Additional Learning Objectives**

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1. Students will understand that objects require a force on them to make them move, and that objects will move until something stops them
2. Students will learn different ways objects can begin moving and what each way can be used for.
3. Students will work with other members of a group to problem-solve, design, and create a track which guides an object across several obstacles.

### **Required Background Knowledge**

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None

### **Essential Questions**

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1. How do objects move?
2. How do objects stop moving?
3. What are ways that objects can begin moving?
4. What are the first steps in the Engineering Design Process?

### **Introduction / Motivation**

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The instructor can introduce students to the concepts of motion and how a force, like pushing, pulling, dropping, throwing, etc. creates motion and that an object in the way stops motion, and that an object will not go without being moved. The instructor can demonstrate dropping a ball, rolling a ball, letting a ball roll downhill, and having a ball jump off a ramp. The instructor can also ask what things move and what causes them to move (i.e. rollercoaster, car, boat, etc).

### **Procedure**

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Part 1: (50 minutes)

1. Discuss the idea of motion again with the students. Introduce gravity and discuss how objects fall when they do not have anything underneath them. Also, discuss how ramps can be used to direct motion upwards.
2. Place the students into small groups (3-4 students)

3. Introduce the challenge of getting an object from one point to another using the track without touching or pushing the object. Show them how the track guides the object, and give them a specific starting point and ending point.
4. Allow the students to work in teams, and experiment with the challenge.
5. When completed, introduce obstacles between the two points. Vary the width and height of the obstacles to require that some be gone over and some be gone around.
6. Hand out blueprints (attached) and have the students design a track shape to overcome the obstacles.
7. Have each group build and test their track one at a time.
8. Discuss with the students what worked, what did not, and why.

### **Materials List**

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<b>Materials per class</b>	<b>Amount</b>	<b>Location</b>
Foam rubber pipe insulation, cut in half lengthwise	12 feet total length	Hardware store
Tape (for connecting track)	1 roll	Hardware store
Obstacles of various sizes and shapes (desks, chairs, etc.)	At least 1, no limit.	Classroom

<b>Materials per Student</b>	<b>Amount</b>	<b>Location</b>
Ball or marble sized to fit type of track	1	Toy or sporting goods store
Blueprint sheets	1	Attached

### **Vocabulary with Definitions**

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1. *Motion* – The word for when an object is moving
2. *Gravity* – A force that causes objects to fall
3. *Ramp* – A simple machine, which allows moving, objects to change direction up or down

### **Assessment / Evaluation of Students**

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The instructor may assess the students in any/all of the following manners:

1. Observe student groups at work.

2. Collect student worksheets.
3. Determine whether students understood the Engineering Design Process.
4. Determine whether students understand the concepts involved.

### **Lesson Extensions**

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1. (Engineering) Discuss with students various real-life vehicles, how they move, and handle obstacles. Introduce students to other ways objects can move (i.e. engines)
2. (Engineering) If using toy cars, introduce students to wheels, axles, and how they roll when put in motion. Discuss how real life vehicles use them.
3. (Engineering) Have the students design a complete rollercoaster around the classroom. See if they can get the marble to come back to it's starting point.

### **Attachments**

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1. Track Blueprint

### **Troubleshooting Tips**

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1. If time does not allow testing each student's ramp, have the students decide as a group the best way around each obstacle.

### **Safety Issues**

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None

### **Additional Resources**

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FOSS Kit # WX742-5015

*Finish*

Name

*Start*

Track Blueprint