

# Motion and Design Concept Storyline

## Unifying Concept

The success of technological products depends on the scientific characteristics of their design and their value in application.

## Unit Concept

Successful vehicle design requires an understanding of energy, force, and friction, as well as of the properties of materials and cost considerations.

## Grade-Level Concept

Models may be used to test and adapt the variables and components that affect the efficiency of a design.

### Subconcept 1

The products of technological design must meet certain specifications, which are set forth in technical drawings.

Lesson 1: Pre-Unit Assessment: Designing Vehicles: Getting Started  
*Students build vehicles to meet design requirements.*

Lesson 2: Using Drawings to Record and Build  
*Students draw the vehicles they designed in Lesson 1 and learn about technical drawing.*

### Subconcept 2

The position and motion of an object may be changed by a force, such as pushing or pulling.

Lesson 3: Pulling a Vehicle: Looking at Force  
*Students study the principle that force applied to an object changes its motion.*

Lesson 4: Testing the Motion of Vehicles Carrying a Load  
*Students test how adding weight (load) to their vehicles affects their motion.*

Lesson 5: Designing Vehicles to Meet Requirements  
*Students build vehicles to meet design specifications.*

### Subconcept 3

The forces acting on a vehicle include different forms of energy that act as driving and resisting forces.

Lesson 6: Evaluating Vehicle Design: Looking at Rubber Band Energy  
*Students examine different energy sources to drive their vehicles.*

Lesson 7: Testing the Effects of Rubber Band Energy  
*Students investigate how variable amounts of energy affect the motion of their vehicles.*

Lesson 8: Evaluating Vehicle Design: Looking at Friction  
*Students examine how their design variables reduce or increase the force of friction on their vehicles.*

Lesson 9: Designing and Building a Vehicle with a Sail  
*Students adapt their vehicles to hold a sail and discuss how it might affect their motion.*

Lesson 10: Testing the Effects of Air Resistance on a Vehicle's Motion  
*Students explore air resistance.*

Lesson 11: Building a Propeller-Driven Vehicle  
*Students design and build propeller-driven vehicles and compare them with their axle-driven vehicles.*

Lesson 12: Analyzing the Motion and Design of a Propeller-Driven Vehicle  
*Students evaluate the design of their propeller-driven vehicles.*

### Subconcept 4

Technological designs and products may be evaluated in terms of their cost, as well as their scientific and technological efficiency.

Lesson 13: Looking at Cost  
*Students determine the cost of their vehicles and modify the design to reduce cost.*

Lesson 14: Planning Our Final Design Challenge  
*Student teams brainstorm how they will solve a design challenge.*

Lesson 15: Refining Our Design  
*The teams build and test their vehicles and refine their design plans.*

Lesson 16: Presenting Our Final Design Challenge  
*The teams present their solutions to their classmates.*

Lesson 17: Post-Unit Assessment: Sharing What We Know about Motion and Design  
*Students reflect on and discuss what they have learned.*