

Lessons at a Glance

Science Content: Big Ideas

The Motion Unit concentrates on the following “big ideas.” These concepts, along with the scientific Habits of Mind discussed on page 6, should be reinforced throughout the unit. The lessons in which each big idea is introduced or is a major focus are indicated in parentheses.

Lessons

- Motion is movement. You can describe an object’s motion by how long it takes, how far the object travels, how fast the object goes, and what path it follows. (Lessons 1-4 and 13)
- The way to change how something moves is to give it a push or a pull. (Lessons 5-13)
- Collisions cause pushes that may change the motion of all the colliding objects. (Lessons 7 and 8)
- Friction is a force (a pull) that slows down moving objects. (Lessons 9 and 10)
- On Earth, gravity is a force that pulls everything down all the time. (Lesson 11 and 12)

Skill Building Activities

- Observation is a powerful tool for learning about something. Detailed and accurate descriptions of your observations help you communicate them to others. (Observing and Describing)
- Measuring how much something weighs is a basic scientific skill. (Using Balances and Scales)

Lesson Overviews

The following overviews briefly summarize each lesson in the Motion Unit. Core lessons are indicated with an asterisk. Suggestions for scheduling and flexible implementation are shown in gray.

Lesson 0: Doing Science

Children sharpen their awareness of scientific thinking as they conduct a self-directed exploration and then reflect on the processes they engaged in. In the context of these experiences, they are introduced to the work of scientists and to the Science Companion “I Wonder” circle, which provides a visual representation of many of the facets of scientific inquiry, exploration, and discovery.

You can find Lesson 0 in the *Teacher Reference Materials*.

Lesson 1: Searching for Motion*

Children contemplate what motion is as they become “motion detectives” who search for, identify, and describe motion in their surroundings. They think of words to describe motion and act out a variety of motions with their bodies, incorporating aspects such as distance, time, speed, change in speed, and path of motion in their demonstrations.

Consider teaching this lesson in two sessions. Session 1 can be taught during language arts. Session 2 involves a walk outside of the classroom (indoors or outdoors).

Lesson 2: Drawing Motion

Children act out different motions with their bodies and then depict motion in a drawing. They try to incorporate some of the components of motion—such as time, distance, speed, and path—in their drawings.

This lesson can be taught during art.

Lesson 3: Observing and Describing the Path of Motion*

Children focus on the path of motion, using their bodies and a ball to create and describe different paths. By comparing different paths between the same points, they learn that a good description of an object’s motion includes information about its path.

Lesson 4: Conducting Speed Trials*

Children investigate and compare the speeds of various motions they make with their bodies. They move in different ways (jumping, walking backwards, and crawling) for a fixed amount of time and measure how far they travel doing each motion. Building on this activity, the children compare the speeds of different motions and begin to develop an understanding that speed is determined by factors of time and distance.

This lesson can be taught during P.E. or mathematics.

Lesson 5: Changing Motion: Starting Things Moving and Changing Direction*

Children begin an extended study of how forces (pushes and pulls) change an object's motion. They use toy cars and other props to discover that pushes and pulls are needed to get a still object to start moving. They also learn that pushes and pulls are required to change the direction of an object's motion, and they contemplate other changes in motion, such as slowing down and speeding up.

Consider teaching this lesson in two sessions. It would work well to teach the introductory discussion and exploration in one session and conduct the sharing and synthesizing discussion during a second session.

Lesson 6: Comparing Big and Small Forces*

Children explore the effects of forces of varying sizes on the motion of toy cars. They discover that big forces change the motion of toy cars more than little forces do.

Lesson 7: Creating Collisions: Rolling and Bumping*

Children continue their investigation of forces by performing controlled collision experiments with marbles rolling along a track. By varying several factors, the children begin to realize they can change the strength of the forces involved in the collisions. They also identify conditions that make a marble roll partway along a track and those that make it roll all the way to the end of the track.

Consider rotating small groups through the exploration over the course of one or more days.

Lesson 8: Experimenting with Collisions

Children use the marbles and tracks from Lesson 7 to create controlled collisions and observe the motion of the colliding objects. They design their own collisions, trying to change just one condition at a time.

Consider rotating small groups through the exploration over the course of one or more days.

Lesson 9: Slowing Things Down With Friction*

Children study friction by sliding pennies on a variety of surfaces and comparing how far the pennies travel before they stop. Through their explorations, they learn that friction is a force that is always present (though often overlooked) and that different surfaces exhibit different amounts of friction. A common misconception, that moving objects slow down on their own, is also addressed in this lesson.

Consider teaching this lesson in two sessions or rotating small groups through the exploration over the course of one or more days.

Lesson 10: Sliding and Sticking: Exploring Friction and Traction

Children continue to investigate friction as they test the amount of traction created by various kinds of shoes. They discover that the degree of traction shoes supply depends on the materials, textures, and tread patterns of the shoes' soles: there is more traction when there is more friction between the shoe and the surface it is sliding on. They also realize that, although friction is sometimes a nuisance because it slows things down, at other times we rely on friction for just that reason.

This lesson includes one indoor and one outdoor exploration. You can choose to do one or both activities. If you do both explorations, you may want to do them on different days or do the "Outdoor Slide Climb" during recess or P. E.

Lesson 11: Gravity: Down to Earth*

Children observe and describe the effects of gravity on their bodies and on falling objects and begin to think about the relationship between weight and the pull of gravity. They draw pictures of what the classroom would look like without gravity to help them realize how universal gravity really is. They also participate in a science talk in which they consider whether gravity is a force.

The “Imagining and Drawing a Place With No Gravity” exploration could be done during art.

Lesson 12: Dropping Marbles: More Experimentation With Gravity

Children drop marbles of different weights to further explore the effects of gravity. They observe that marbles dropped at the same time always land at the same moment, no matter how much the marbles weigh. The children also see that the heaviest marbles make the biggest holes.

You might want to set up this exploration in the Science Center for interested children, rather than teach it to the whole class.

Lesson 13: Motion Madness*

Children review important concepts from the Motion Unit as they slide, jump, and experiment with colliding balls. They try to give detailed descriptions of each of the motions used in these activities and consider some of the pushes and pulls (forces) involved. This fun, action-packed lesson can be taught outdoors on the playground or indoors in the gymnasium or another suitable open space.

This lesson can be taught during P.E.

Skill Building Activity 1: Observing and Describing

Children practice making accurate and detailed descriptions before and after observing a familiar object. In doing so, they discover the importance of careful observation and detailed description in science.

Skill Building Activity: Using Balances and Scales

Children compare the weight of various objects using balances and scales. They gain an appreciation and awareness of weight, and strengthen their measuring skills.