



Classroom Teacher Preparation

Physics 19B: Friction Basics

Please use the following to prepare for the next SfS lesson.

Description:

This lesson provides students with an introduction to friction as a force that opposes motion. Students experiment with different surfaces and classify them as having low, medium, or high friction. Longer classes may investigate the effect of added mass on the force of friction. This lesson is geared towards younger students. A 6th-8th grade version of this lesson is also available.

Lesson Objectives – SWBAT (“Students Will Be Able To...”):

3rd-5th

- Explain that friction is a force that resists movement along a surface
- Classify different materials as having “low”, “medium,” or “high” friction

Disciplinary Core Idea (DCI)

PS2 Motion and Stability - PS2.A Forces and Motion and PS2.B Types of Interactions

- (3rd-5th) The effect of unbalanced forces on an object results in a change of motion. Patterns of motion can be used to predict future motion. Some forces act through contact, some forces act even when the objects are not in contact. The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center.

Science & Engineering Practice (SEP)

Analyze and Interpret Data

- (3rd-5th) Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.
- (3rd-5th) *Optional:* Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.

Planning and Carrying Out Investigations

- (3rd-5th) *Optional:* Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

Crosscutting Concept (CCC)

Patterns

- (3rd-5th) Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.

Preparation:

It is helpful for students to be familiar with the concept of *force*, defined as *the push or pull experienced by an object, as a result of an interaction with another object*.



Room Set Up for Activities:

Students will be working in pairs or trios. Each group will need a clean, flat workspace. A cleared-off desk top will be a large enough size.

Safety:

There are no safety concerns for the students with this lesson. Please consider whether tables or the floor would be the better workspace for your students, to minimize the chance of breaking the ceramic mugs.

Related Modules:

This lesson may be taught as part of a sequence or group of related modules on **Forces** designed especially for younger students. Modules include:

Physics 5: Pendulum Patterns – Students are introduced to pendulums and their periodic motion. They test the effect of different lengths on the period of the pendulum and predict the period for an untested length.

Other Forces-related modules for younger students coming soon!

For other module sequences and groups, look here: www.sciencefromscientists.org/sequences

Standards Covered:

Please click the following link to our website to review the standards covered by this lesson, listed by state: www.sciencefromscientists.org/standards/

Lessons are matched to both national NGSS and local state standards.

After Our Visit:

Extend this lesson by interleaving the pages of two phonebooks to investigate the effect of adding frictional forces together.

Access this Extension activity by visiting the Classroom Post found on our website at sciencefromscientists.org/cohorts. Use the name of your school/cohort and password to log in.

To help Evaluate, check out our Open Response questions online at sciencefromscientists.org/open-response-questions. They are freely available for all of our lessons for current teachers. Use the password supplied by your instructor to log in.

Additional Resources:

Videos (they needed *two*) of the Mythbusters trying out the Extension activity are impressive and entertaining:

- https://www.youtube.com/watch?v=AX_ICOjLCTo
- https://www.youtube.com/watch?v=QMW_uYWwHWQ

More simple friction activities:

- Demonstrating friction with rice: <https://www.youtube.com/watch?v=vn9fKJc1jkE>
- For younger students, this activity uses friction to make a slider toy work: <https://pbskids.org/designsquad/pdf/parentseducators/treasuregrab-english.pdf>

