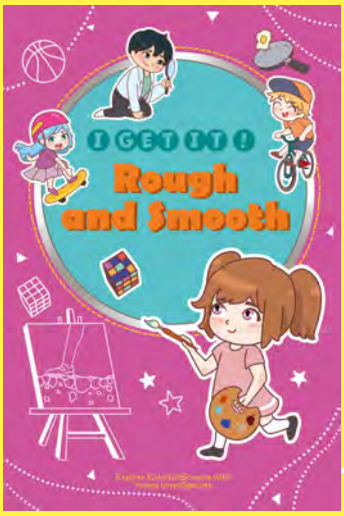
READ WITH YOU TEACHING GUIDES

ROUGH AND SMOOTH



Page count: 32
ISBN: 979-8-88618-203-3
Grade: K-2
Series: I Get It!
Topic: Physical Science
Focus: Friction
SEL Themes: Experimentation, creativity, group work
Key Vocabulary:
- friction
- force
- smooth
- rough
- liquid

Key Skills:
- Comparing rough and smooth surfaces.
- Imagining life without friction.
- Applying concepts to real-world scenarios.

Takeaways:
- We experience less friction on smoother surfaces.
- Adding liquid to a surface makes it smoother.

45-Minute Lesson Plan

Time	Activity	Instructions
5 mins	Build context and encourage conversation about topic of friction.	Welcome students in with a table with 3-4 objects of varying smoothness. Ask the students to rank the items from smoothest to roughest. Encourage them to touch the objects if needed.
20 mins	Read the book in class and ask questions.	Read *Rough and Smooth* out loud to the class. Complete the cheek-rubbing activity and ask comprehension and extension questions as you read.
5 mins	Discussion after reading book	**Literal Comprehension**: 1. What was this book trying to teach us? 2. What new words did we learn in the book? 3. How does friction help a bike-rider brake? **Extended Thinking**: 1. What other examples could the author use to teach you about friction? 2. Will a bike go faster on a bumpy brick road or a smooth paved road? Why? 3. What would be a fun activity to do in a world without friction? 4. What would be a difficult activity to do in a world without friction?
5 mins	Students summarize and write.	Ask the students to write down two facts they learned from the book. Give students at least 2 minutes to write, then encourage them to share either in pairs or with the class.
10 mins	Classroom Activity	See instructions on next page
0-5 mins	Worksheet	Distribute the worksheet to the class. You can assign it as homework or complete it in class.

Common Core State Standards

This lesson plan employs the following Grade 1 English Standards: Informational Reading 1-4, Writing 2, Writing 8, and Speaking and Listening 1-4.

Next Generation Science Standards

This lesson plan employs the following Kindergarten-Grade 2 Physical Science Standards: K-PS2-1, 2-PS1-1, 2-PS1-1.

ROUGH AND SMOOTH CLASSROOM ACTIVITY

Time: 5-15 minutes

Materials for Demonstration 1:
- Rice
- Pencil
- Funnel
- Empty plastic bottle
- Spoon or measuring cup

Materials for Demonstration 2:
2 large, soft-cover books with 100+ pages (phonebooks are ideal)

Key Skills:
- Making a hypothesis.
- Testing a hypothesis.
- Explaining unexpected results.

Takeaway:
- The friction created by many small surfaces can add up to a significant force.

Demonstration 1

- Bring out the materials and ask, "Can I lift a bottle of rice with a pencil?"
- Pour rice into a bowl and place the funnel into the bottle.
- Use the spoon or measuring cup to scoop the rice into the funnel.
- Tap the bottle on the table to settle the rice and continue filling until the bottle is mostly full.
- Place the pencil into the bottle. Work it into the rice, gently banging the bottle to get the pencil thoroughly stuck.
- Grab the pencil and lift the bottle!

Key Teaching Point: The pencil can lift the whole bottle because the rice is packed in so tightly around the pencil! The friction between the rice and the pencil keeps the pencil from sliding out of the bottle.

Demonstration 2

- Open the books facing each other and overlap half one book with another and show how easy it is to pull them apart.
- Interlace the pages by facing them in toward each other and alternating a page from each book. Overlap the pages by several inches. So, lay down the back cover of book A, then the back cover of book B. Then, the back page of book A and the back page of book B. You can weave several pages at a time.
- Ask your students, "Do you think we can easily tug the two books apart?"
- Ask two student volunteers to each grab one of the book spines and see if they can pull them apart. Encourage a gentle tug of war.

Key Teaching Point: The books stick together because each page exerts friction against the other book's page. The combined friction from each of the pages adds up to a tough force!

Deeper Dive: Friction and Bumpy Surfaces

Friction increases along with the irregularities in the two surfaces that are touching. The more bumpy or irregular a surface is, the more it entangles itself with the other surface, slowing movement and producing heat. When we add liquid to a surface, we are filling in some of those tiny gaps and reducing the irregularities.

Real-Life Connections: Skiing

What makes skiing fun? The fact that you are going so fast down a slippery hill! And why is skiing faster than just sliding or tumbling down? The answer is friction. The skis are designed to be as smooth as possible, and the packed-down snow is also smooth. This means there is very little friction between the skis and the ground, which makes it easy to speed downward.

ROUGH AND SMOOTH WORKSHEET

When two objects touch, a force called **friction** slows them down. Friction happens between any two surfaces and makes heat. The rougher a surface is, the more friction it makes!

Draw arrows showing where friction is happening in each picture below! Then, draw your own picture and add arrows to the spots with friction.

1

2

3

4

5

6