Friction
2nd or 3rd Grade
Bret Underwood

Benchmarks:
SLC 12: Students will explore how friction changes motion.

Objectives:
Students will apply knowledge gained from *Motion* lesson to understand how and why friction is important.

Materials:
- Incline Planes
- Transparency paper
- Paper
- Soap
- Blocks
- Big Erasers
- Rocks
- Ice Cubes
- Coins

Set Up:
Before the class starts, demonstrator should cut out strips of paper and transparency paper to cover the tracks of the incline planes. Demonstrator should tape the transparency paper strips to the incline planes first (smooth side up), then tape the paper on top of the transparency, creating two layers covering the original track.

Initial Demonstration:
Demonstrator takes the covered incline plane and the wood block. Demonstrator has a student come up and hold the block at the top of the incline plane, and drop the block so that it slides down the track. Student measures the distance from the end of the track that the block moved.

Initial Observations:
- The block slid down the track
- The block stopped
- It stopped 10 cm from the end of the track

Initial Model:
(From *Motion* lesson):
-Objects tend to stay put unless they are pushed or going downhill or dropped
-(For one object resting on another) When the bottom object is pushed forwards hard or fast, the other falls down and a little backwards, unless the top object is taped or glued or stuck somehow on the top object.
-*Objects tend to stop moving eventually*

Procedure:

Break the class up into groups of 4-5 students per group. Give the groups one of the covered incline planes and a set of materials to drop. Ask the students if they think that any object will stop at the same place when slid down the incline plane. Ask the students to prove that this is not true by sliding several different objects down the ramp and measuring how far they slide. Have the students make remarks on the feel of the material, i.e. smooth, rough, hard, soft, etc…, and describe them appropriately on the data sheet.

Discussion/Summary:

Did the students find that all of their objects stopped at the same place? Which ones went further? What do those objects feel like? (Are they smooth, rough, etc…) We call the thing that stops these objects friction. Which object has the most friction? The least? What do you think would happen if we had an object that was <u>really</u> smooth? Could it go on forever? How can we change our "model?"

Target Model:

-Objects tend to stay put unless they are pushed or going downhill or dropped
-(For one object resting on another) When the bottom object is pushed forwards hard or fast, the other falls down and a little backwards, unless the top object is taped or glued or stuck somehow on the top object.
-Objects tend to stop moving eventually, *some objects stop sooner than others.*

Demonstration:

Demonstrator takes the paper covering off of the incline plane and exposes the transparency paper underneath. Demonstrator has a student come up and hold and release the wooden block from the top of the incline plane again. Student measures the distance the block traveled from the edge of the incline plane. Have the student feel the plastic.

Observations:

- The block slid down the ramp
- The block stopped
- It stopped 15 cm from the end of the track
- It went further than the block did the first time

Target Model:

-Objects tend to stay put unless they are pushed or going downhill or dropped
-(For one object resting on another) When the bottom object is pushed forwards hard or fast, the other falls down and a little backwards, unless the top object is taped or glued or stuck somehow on the top object.
-Objects tend to stop moving eventually, some objects stop sooner than others.
-*A smooth surface lets things go further.*

Procedure:

Break the students back into their groups. Take the paper covering off of each group's incline plane. Ask the students to re-do their testing with the same objects, but this time with the plastic covered track, testing to see the plastic covering on the track helps the object go further. Have the students record the amount that the object goes each time on their data sheet.

Discussion/Summary:

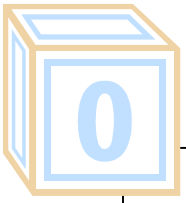
What did the students find? Did the objects go further this time? Why do they think so? What are some real-life examples where this could be very important? (i.e. car on ice, ice skating, sledding, oiling a bike tire, etc…)

Target Model:

-Objects tend to stay put unless they are pushed or going downhill or dropped
-(For one object resting on another) When the bottom object is pushed forwards hard or fast, the other falls down and a little backwards, unless the top object is taped or glued or stuck somehow on the top object.
-Objects tend to stop moving eventually, some objects stop sooner than others.
-A smooth surface lets things go further.

Prove Me Wrong: Any object that slides down the ramp will stop at the same place

Data Sheet



Block:
Distance on Paper:

_____
What does it feel like?

Distance on Plastic?:

_____

Names:

_____

_____

_____

_____

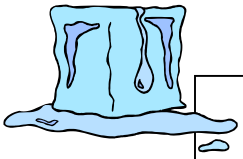
_____

Rock:
Distance on Paper:

_____
What does it feel like?

Distance on Plastic?:

_____



Ice Cube:
Distance on Paper:

_____
What does it feel like?

Distance on Plastic?:

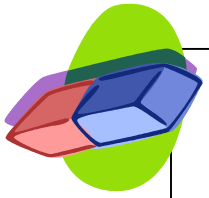
_____

Coin:
Distance on Paper:

_____
What does it feel like?

Distance on Plastic?:

_____



Eraser:
Distance on Paper:

_____
What does it feel like?

Distance on Plastic?:

_____