Braking for Safety

Different road surfaces influence the ability to stop a vehicle. When traveling on gravel roads not only does the friction of the road surface affect braking ability, but also the control the driver has on his/her vehicle. Discuss how gravel, dirt, and mud hinder the ability of the driver to have control of the vehicle. Discuss characteristics such as snow and ice relative to rural roadway driving.

ACTIVITY 1
Friction comparison  
Targeted Audience: Middle to high school age

Learning Objective: Students will compare a road’s surface on a vehicle’s ability to brake effectively.
Concept: Tires, friction, and surfaces affect a vehicle’s braking ability. Braking ability influences the likeliness of a resulting crash.

Vehicle tires push against the road to help propel the car forward. All surfaces are covered with little bumps and hollows. When two surfaces rub together, these bumps and hollows catch and stick to each other. This resistance to sliding is called friction. The tread on tires creates friction between the rubber and the road surfaces so cars are able to accelerate and brake rapidly. If there was little or no friction between two surfaces, the tires would slide around. This happens on ice because smooth surfaces decrease the friction between the tire and the road. Bald tires can also have this effect.

You will need:
- Matchbox vehicles
- 5" X 36" strip of fake fur material (representing very rough road surfaces)
- 5" X 36" strip of coarse sandpaper (representing moderate road surfaces)
- 5" X 36" strip of wax paper (representing slick road surfaces)
- 36" square flat board
- Ruler

Follow these steps:
1. Glue each strip onto a flat surface.
2. Place a toy vehicle at the narrow edge of each “road surface”. Give the car a push.
3. Measure how far the car moves.
4. Raise the board slightly and repeat steps 2 and 3 keeping the push the same for each vehicle. Measure the distance traveled by each vehicle. Notice the direction the vehicle moved. Did it go straight? Why or why not?

Rough surfaces can create more friction than smooth surfaces. When a small amount of friction is present, the vehicle traveled a long distance. When a large amount of friction is present, the vehicles traveled a short distance. Ice, rain, and bald tires decrease the amount of friction on the road surface. The type of road surface also makes a difference in the amount of friction present. Don’t be fooled into thinking the more gravel on the road, the better you will be able to stop. Getting caught in loose gravel can pull you into the ditch. Gravel road driving is different than driving on paved surfaces and requires extra training.
ACTIVITY 2
Road surfaces impact the stopping distance and skid length of a vehicle when it has to stop suddenly. There are web sites that do the calculations for different situations (dry, icy, wet, etc.).

This is just one web site and others are available. Find them by typing in “stopping distance calculator” in the search box.

http://forensicdynamics.com/stopping-distance-calculator

Make comparisons about resulting distances required when traveling on different road surfaces. This calculator does not take into account upward/downward road slant or snow/ice/gravel depth. Make predictions about how these variables would impact stopping distance.

Questions to Ponder:

- Which road surface would have more friction: A loose gravel road or a hard-packed gravel road? A paved road or a gravel road?
- Why are tires with reduced tread considered unsafe?
- How is skid length affected by speed and road surfaces?