**Vernier Labquest Replacement Investigation**

**Grade 7 Kit: FOSS Force and Motion Investigation # 2a**

**Title of investigation:** Force, Speed, and Acceleration

**Authors:** Tim Braunsdorf and Tom Mailloux

**Guiding Questions:** How does the angle affect the speed of a car going downhill?

**Summary of activity:** Related to all seven physical science standards 7.1.1 to 7.1.7, but mostly 7.1.7: How speed or direction of motion changes when a force acts upon it.

**Equipment used:**

Per group: Vernier Labquest and motion detector, ramp (books plus board), toy car.

Consumable: none

**Description of Procedures, notes (teacher manual):**

Each group sets up a ramp, (a 1 meter long board, plus an adjustable pile of books at one end) and clamps a motion detector at the top of the ramp. *(We also tried using a photogate, but the motion detector works better.)*

Measure the time taken for an object to reach the bottom of the ramp. Decide which angle results in the fastest time. Begin developing a definition for speed.

Variations: repeat measurement at different ramp angles: use different sliding blocks/toy cars/marble.

Find the angle at which the speed is constant.

**Scientific questions:**

What are the relationships between position, speed, and acceleration?

How does force account for these relationships?

Why does the speed/acceleration change with angle?

How does force change with angle?

What energy transformations are occurring? Is energy conserved?

**Connections:** Where does the energy come from and how is it used in different types of transportation – cars, trains (electric and diesel), airplanes…