Safe Driving Lesson Plan Physics

Grade level: 10-12

Subject area: Physics

Duration: 20-50 minutes

Objectives:
Students will do the following:

1. Study the potential dangers, risks and statistics associated with a variety of road safety issues such as speeding, driving while distracted, and driving while drowsy.
2. Study the motions and forces involved in with a hypothetical crash.

Materials:

- Impact Posters
- Impact Relative Risk Wheel

Procedures:

1. Using the data from hypothetical crashes with different variables, calculate the velocity of these crashes and surmise what such forces would do on the human body.

Example of a hypothetical crash and possible calculations:

A Ford pickup truck is travelling east at an unknown velocity. A Toyota Camry reaches the intersection, traveling south and stops before proceeding. Believing that s/he has enough time, the driver of the Camry starts into the intersection.

As the Camry is about to leave the intersection, a child, who was behind some parked cars and not seen by the driver, crosses in front of it. This forces the driver to stop while still in the middle of the intersection.

Because the driver of the truck was distracted, they never brake. The Ford pickup truck slams into the stationary Toyota Camry. The two vehicles are in an inelastic collision. They leave skid marks that are 22.5 m long.

- How fast was the truck traveling before impact?

Each vehicle had one driver only. We'll assume that each driver was about 75 kg. The mass of the truck (with load) is 2722 kg, and the mass of the car is 1556 kg. Adding the mass of the drivers gives:

Truck : 2797 kg Car : 1631 kg

The coefficient of friction of the car's tires was found to be =0.47 Retarding force of the car, Fr = 0.47 Fn = 0.47(m g)
= 0.47 (1631)(9.81)

= 7520 N

Conservation of momentum m1 v1 + m2v2 = (m1 + m2)v 2797 v1 + 0 = (2797 + 1631)v v1 = 1.58 v

a = -Fr / m (there's a minus sign because F opposes motion)

= - 7520 /(2797 + 1631) = - 1.70 m/s^2

V^2 = v^2 + 2 a d, V final = 0 v^2 = - 2 (- 1.70)(22.5) = 76.5
v = 8.75 m/s

initial v = 1.58 (8.75) = 13.8 m/s = 49.7 km/hr

The minimum velocity of the truck was about 50 km/hr, which was the posted speed limit.

Standard:
Science 12.3.4: Students will develop an understanding of motion and force