ATV Tires

Objective: Comprehend the unique characteristics of ATV tires and their capability to travel on rough terrains.

Targeted Age: Middle school and above

Materials:
- Round medium sized balloons
- Rigid driving surfaces (plywood, heavy cardboard, or corrugated plastic) that can be inclined to various degrees

The tires on ATVs are wide, bumpy, and designed to use low air pressure. This allows the tires to grip ground surfaces so the ATV can drive on areas where regular vehicles like cars and trucks cannot. This same surface gripping capability can cause problems if used on smooth surfaces like pavement. This activity involves water that may cause a mess if the balloons break. It might be wise to do the activity outside where water will not create a problem. If done inside, protect the floor with plastic.

Before the demonstration prepare two or more “road surfaces”. One should be rigid and smooth to represent pavement. The other surface(s) should be rough and uneven. This can be done by taping or gluing items (cut out cardboard, sand, rocks, crumpled paper, etc.) on cardboard. The cardboard itself could be bent to create “ravines” or “hills”.

Fill the balloons with various amounts of water from very little (half cup) to a lot (several cups until the balloon is taut). Tie each balloon securely. The least filled should be squishy and represents low pressure. The most filled will be very round and represent high pressure. Those in-between represent various degrees of pressure. Place each filled balloon on a flat surface. Ask students to observe the amount of surface of each balloon touching the surface. When the pressure is low there is more surface touching the “road surface”. Have the students estimate the percentage of touching surface of each balloon. As the balloon expands with more water the total surface area increases, but the surface area touching the “road” decreases.

Using the same amount of force with each balloon, gently roll each across the different road surfaces. Compare the road surfaces and the different balloons. The balloons with the most water should roll faster. Those with little water may not roll at all without pushing. Put each board on a slight incline by putting books under the end. Gently roll the filled balloons again. Repeat the demonstration again after increasing the incline by adding another book. Observe what happens.
ATV Tires (continued)

Q: What do the balloons represent in this demonstration?
A: The balloons represent inflated ATV tires. The greater the amount of water added to the balloon represents increasing the pressure in the tire. Air, not water, is used in tires.

Q: How does pressure influence the direction and speed of “the tire”?
A: When more surface area touches where the object is rolling, it slows down the object. The less the object touches the road surface the faster it will go. It will also be more likely to go in a straight line. There is less surface to grab onto.

Q: Why are ATV and bicycle tires different and why?
A: Bicycle tires have very little surface area touching the road surface because the tires are built thin using high air pressure. This allows the bike to travel easily and fast. Mountain bikes have wider tires with deeper tread than racing bikes to be able to ride on more uneven surfaces. ATV tires are wider yet with lots of surface area touching with lower tire pressure. The ATV has power to travel up steep inclines and needs the surface area of wide, bumpy tires to grab onto surfaces.

Q: How did the objects on the “road surface” influence the balloons when they rolled?
A: The greater the amount of pressure (more water in the balloon) the more they bounce off objects. The lower pressure (less water in the balloon) the slower it goes and the more likely the balloon will go over objects. The low pressure balloons grab the “road” and objects instead of deflecting them. ATVs have a power source other than simply pushing the balloons with your hand which means an ATV can drive over raised surfaces.

Q: How does tire pressure influence the use of ATVs on smooth surfaces?
A: The low pressure rubber tires have a lot of surface touching the road surface. If the vehicle stops suddenly, the low pressure tires grab the road surface and can throw the operator off the vehicle. In addition, hard surface areas can cause more damage to the body than less rigid surfaces when it hits.