Transmission Investigation #2: Effect of Wheel Size

Objective

To determine how acceleration and speed are affected by changing the size of the wheels on a model solar car.

Materials Needed

- Prototype car
  - Chassis
  - Wheels
  - Motor
  - Temporary power source (3V battery)
- Lightweight foam tape

Procedure

1. Explain to students that wheel size is as important a factor in the car's design as the transmission ratio; in fact, they are closely related. The faster the axle rotates in the bearing the more friction and drag it will have. A larger wheel will allow the axle to rotate more slowly (if the car is to go at the same speed), and will waste less power in the bearings.
2. Have students calculate the distance their car travels for one revolution of the motor. The transmission ratio will tell you how many revolutions the wheel axles will turn per motor revolution, and the size of the wheels will tell what linear distance the car will travel per wheel revolution.
3. Have students experiment with varying the wheel diameter by building up the diameter of the drive wheel(s) on the prototype car. Use various materials like weather-stripping foam tape to increase the diameter of the wheels.
4. Conclude with a discussion using the following questions:

- How much larger would the wheels need to be to make the car's top speed twice as fast? Three times as fast?
- How can large wheels hurt the performance of your car?
- How does the size of the wheels affect acceleration?

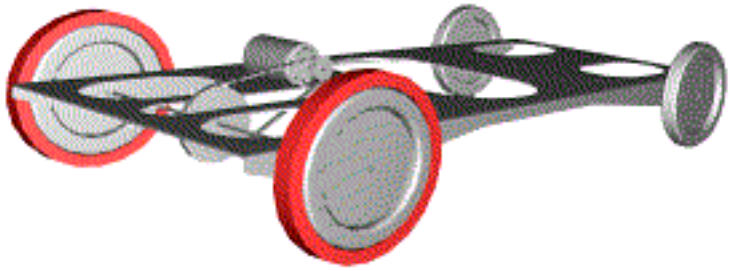

Figure 3: Investigation setup— add to size of the drive wheels using material like weather-stripping foam tape

Sources: Adapted from *Junior Solar Sprint: Classroom Investigations*, by Andrew Heafitz for NREL, 2001; and materials created by Rick Butchart for the Chimacum School District in Washington; used with permission.