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How can OneCar assist you in your classroom?

Here are a few ideas . .

at Elementary level

- Do an investigation to compare the effects of different strengths or different directions of **pushes & pulls** on the motion of the car
- Run the car on a **variety of surfaces** (rug, tile, concrete, etc) to see the effects of resistance
- Launch the car from an **inclined plane** or power using any of the energy sources to create a collision with another stationary car. Or have two cars traveling in the same direction, at different speeds, collide with each other
- Chemical Car: Allow young learners to experiment with the **amount of water** added, to investigate the speed and duration of the Chemical Car. Use a scale to quantify the mass of the Chemical Car
- Elastic Car: Students can vary the number or size of **elastic bands** added to the car. Students can vary the number of wraps of the elastic band.
- Solar car: Students can use different **sunny conditions** to evaluate optimum driving conditions for the OneCar

at Middle school level

- **Build and rebuild** the OneCar in a variety of ways to better understand energy, force and momentum
- With the systematic use of **variables** in the trials, students evaluate each powered type of car and determine the forces (pushes and pulls) acting on the car
- Hand sketches can be made of each car, using arrows to indicate the acting forces on the car to give a better indication of the **net acting force**
- Investigate how **changes in potential energy** affect motion. OneCar can be launched from an inclined plane, elevated to different heights. Or the car can simply be launched from different positions on the ramp. The increase in potential energy should be visible in the attained kinetic energy and speed of the car.
- Students can **engineer** the OneCar in a variety of ways to evaluate and design an optimal solution. For example, students can
  - modify the wheels with different textured tapes or rubber bands to increase the grip
  - reduce the weight of the car by introducing new materials
  - increase or decrease the length of the car by cutting or adding chassis boards
- Battery Car: Students can experiment with “used” **batteries** that may have less stored energy. Students can evaluate: Are all battery brands equal? Test the power

of “new” batteries from different manufacturers. Connect batteries in series and parallel

- Air Car: Use **different sized bottles** while keeping the pressure constant. Investigate how the **size of the hole** in the bottle cap affects performance. Students can turn the car into a rocket by powering it along a line or vary the amounts of air pumped into the bottle.
- Chemical car: Research and look up the **chemical formulas** and properties of the chemicals used, to evaluate the chemical reaction. Describe the chemical reaction in words.
- Propeller Car: Design and create a new shape for the **propeller**. Investigate how the material of the propeller affects motion.
- Solar Car: Plan and investigate how to cover the solar panel with different coloured **transparent gel screens** (light filters) and then monitor the car's output over a distance. Students can change the angle of the solar panel.
- Mousetrap car performance is often evaluated by the **distance a car travels**. To achieve the best distance, the pull force should engage with the axle over the longest possible period. Students can design, test, and redefine their mousetrap powered cars tweaking the following **parameters**:
  - Size and mass distribution of the wheels powering the car
  - The length of the car body and the mousetrap lever arm
  - The weight distribution of the car
  - Friction points in the car

at Senior school level

- Students investigate how **changes in mass** affect the motion. When powered by a constant force such as the electric motor or wind propeller, the mass of the car can be altered (weights added) and the average speed determined between set markers (qualitatively or quantitatively).
- Run trials with the OneCar, and then develop **computer models** to guide possible modifications or variables to the OneCar. A test track can be developed where OneCar runs with one set of wheels along a track (data cable channel). A motion app can be used over a set distance between posts to determine the average speed. (A standardized track will produce more reliable data).
- Calculate the **chemical ratios** for the neutralization reaction using the balanced chemical reaction. Students can research and develop other possible safe chemical reactions that convert chemical energy into kinetic energy.
- Propeller Car: Redesign the **propeller position** or angle. Design and 3D print a new propeller.
- The Solar Car is set up on a smooth surface and is powered by the **reflection** of sun onto its solar panel by a **hand mirror**. Here are a few options:
  • one mirror; • one mirror through a glass window; • one mirror through a red gelled screen (light filter) • two mirrors taking the reflective angles in consideration
- Capacitor Car: Vary the amount of time the capacitor is charged before a test run. Students research, plan and produce a **simple capacitor** made from plastic film and aluminum foil