

Lesson 4: Investigation: Varying Mass

Objective: Students will be able to analyze/evaluate the effect of changing the mass of the car on the car's speed and acceleration

Learning Goal: Newton's 2nd Law of Motion: Changing the mass of car affects the speed and acceleration. The greater the mass of the object the greater the force needed to achieve the same motion.

Vocabulary: Mass, acceleration, grams

Engage:

1. Working in pairs students review their speed data, design, and graphs.
2. "What are some of the factors that possibly contributed to your car not traveling as fast as possible, what caused your car to eventually come to a stop?" Students list possible problems and solutions with their car design.
3. Students share out some of their findings and how they can solve them.

Explore:

1. Students are given the task to transport 3 different masses across a 3 meter track.
2. Students record data for 3 trials for each of the 3 different masses (total 9 trials)

Explain:

1. Teacher explains $F=MA$ and the relationship between force, mass, and acceleration.
2. As we add mass to our cars what affect will it have on acceleration if we keep the force constant? What if we increase the force?
3. Students hypothesize about the possible outcomes of these questions.

Elaborate:

1. Students graph their results to see if their slopes match the predicted outcome.
2. Students share data to analyze if a trend/pattern is evident across groups when adding/subtracting masses.

Evaluate:

1. Students summarize how adding more mass impacted the speed of their vehicle citing data from their graphs, calculating the average speed for each of the mass changes and identifying if there was a positive or negative correlation.
2. Students will have a follow up handout given asking them to solve $F=MA$ problems.