

Band Rubber Car

Subjects Integrated in lesson: Math and physics	Grade: 5 – 8
Suggested Time: 60 minutes	Designer: Mohamed El Mogey

Overview

Students work in groups to design and build their own rubber band cars out of everyday items using engineering design process. They test and race with their rubber band cars, evaluate their results, and present to the class.

Vocabulary

Mass	Friction
Acceleration	Collision
Velocity	Momentum

Objectives

Design and test a rubber band car.

Measure distance and calculate velocity.

Understand the principles and application of Newton's Laws.

Refine designs for best results.

Required Materials

Card board	Rubber bands
Tape	Paper Clip
Scissors	Meterstick
Skewer	Plastic bottle caps
Pencil	CDs
Glue	Glue Gun (When needed only under a supervision by the teacher)

Multimedia Resources

Newton's law of motion

https://www.youtube.com/watch?v=YnXU-AwAjGk&ab_channel=LearnBright

Inertia

https://www.youtube.com/watch?v=qBjmO8w-QqU&ab_channel=FuseSchool-GlobalEducation

Speed Distance Time

https://www.youtube.com/watch?v=EGqpLug-sDk&list=PLW0gavSzhMIRQAtDfN96y055MnChEgin-&index=2&ab_channel=FuseSchool-GlobalEducation

Engineering Design Process

https://www.youtube.com/watch?v=pb2utkZnLbk&list=LL&index=28&ab_channel=TryEngineering

Before the Lesson/ Background Information

- Newton's 1st Law says that an object will continue at a constant velocity unless a net force acts on it, so the rubber band car should do the same, the net force of the rubber band will probably accelerate the car and friction will probably be the net force that will slow its velocity.
- Newton's 2nd Law says $F = ma$ so if we increase the force on the car, it will accelerate faster.
- Newton's 3rd Law says that for every action there is an equal & opposite reaction so as the rubber band pushes on the weight (mass) the mass will push back on the rubber band, pushing the car forward.
- Build your own rubber car to bring to class and show it as an example.
- Velocity = change in distance ÷ change in time

The Lesson

Part 1: Forces and Motion (20 mins)

1. Watch the videos about Newton's law of motion with the students.
2. Review and discuss the videos with the students.

Part 2: Building the rubber band car (60 mins)

1. The class will be divided into groups each group will build their own rubber band car by using the available materials.
2. Each group will make brainstorming and draw the designs for the rubber band car in steps.
3. The groups can trade materials with the other groups and the groups must write list of materials
4. Groups develop their rubber band car and test it on the track the cars must be able to travel in a straight line within a track for a distance of at least 3 meters within a 1 meter wide track.
5. Give the groups extra 20 min for rethink their plan, request other materials, trade with other teams, or start over.
6. Test the finished car designs using the track and let the groups record the distance traveled.
7. Each team then calculates their car's velocity.
8. Make a race between groups and announce the winner.

Reflection

Let the students reflect on the lesson

- How does a rubber band work?
- What might make one car go faster than another?
- Does friction impact the design in addition to force?
- How does weight impact the design?