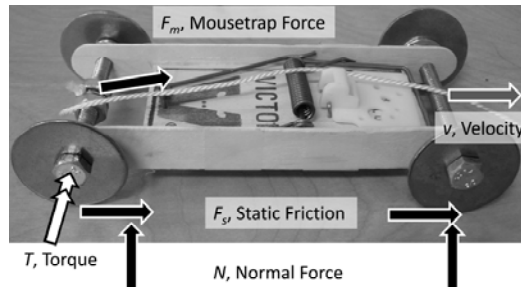




Curricular Unit: Forget the Chedda!

Curricular Unit Title Forget the Chedda!



It can be Engineered to be better.

Grade Level 7 (6-12)

Summary

These lessons explore physical concepts directly related to the mechanics of a mousetrap race car. During this unit, students are encouraged to build a basic mousetrap-powered car and use the concepts addressed in the lessons and activities to modify the design of their car.

Unit Schedule

This unit was developed for a 10-week period. The building stages require a two-week time period due to the curing time of adhesive. All activities use data taken from the basic mousetrap car so that a direct connection is made between the principles of the activity and the performance of the car.

Week	1	2	3	4	5
Lesson/Activity	Construct a Car (Activity)		Quantify It (Lesson & Activity)	Convert It (Lesson & Activity)	Forces, Forces Everywhere (Lesson) Dragged Racers (Activity)
Week	6	7	8	9	10
Lesson/Activity	Torqued (Lesson) Spinners (Activity)	Energetically Challenged (Lesson) Optimize It! (Activity)		Test cars	Compare initial, final data sets (if any)

Unit Overview

All students will begin the unit by building a car out of materials available from any hardware store (not a kit), which can yield multiple design options. A guide is included for the initial build (**Construct a Car Activity**).

After building a mousetrap car, each group may collect data (maximum distance, maximum velocity, etc.) and apply knowledge of units and measurement, then practice conversion between quantities. Students may then use the mousetrap cars for experiments that allow the investigation of friction, torque, and energy concepts.

As an alternative to paper-and-pencil data collection, “Workbook” lessons constructed in [PASCO DataStudio](#) software is used in conjunction with PASCO Motion and Force sensors to conduct the experiments. The lessons integrate video clips and automatically calculate desired quantities so that students may work through the experiments quickly. DataStudio Lite is free software and allows modification of the lesson during a 90-day trial period. **Note:** All files must remain in the source folder when unzipped.

Engineering Connection

This unit is geared toward mechanical engineering design. Throughout the activities students are given opportunities to test their vehicles and compare their results with concepts introduced in the lessons.

Automotive and Aerospace industries are always reviewing and seeking to improve the designs of their vehicles. For this reason, performance sports car makers sponsor the Xtreme Gravity Racing competition, which awards participants for making (and riding) the most efficient vehicle through an obstacle course.

Subject Area(s)

Data Analysis & Probability, Measurement, Physical Science, Problem Solving, Science & Technology

Keywords

mousetrap, racer, forces, friction, torque, angular, linear, velocity, acceleration, analysis, design

Educational Standards

- PA Science:
 - 3.1.7 – Unifying themes
 - 3.2.7.B – Apply process knowledge to make and interpret observations

- 3.2.7.D – Know and use the technological design process to solve problems
- 3.7.7.D – Apply computer software to solve specific problems
- 3.7.10.D - Utilize computer software to solve specific problems
- PA Math:
 - 2.4.5.B – Use models, number facts, properties, and relationships to check and verify predictions and explain reasoning
 - 2.5.8.B – Verify and interpret results using precise mathematical language, notation and representations, including numerical tables and equations, simple algebraic equations and formulas, charts, graphs, and diagrams
 - 2.5.8.C – Justify strategies and defend approaches used and conclusions reached
 - 2.6.8.F – Use scientific and graphic calculators and computer spreadsheets to organize and analyze data
 - 2.7.8.B – Present the results of an experiment using visual representations
 - 2.7.8.D – Compare and contrast results from observations and mathematical models
 - 2.8.5.I – Generate functions from tables of data and relate data to corresponding graphs and functions
 - 2.8.8.B – Discover, describe, and generalize patterns, including linear, exponential, and simple quadratic relationships
 - 2.8.8.I – Generate a table or graph from a function and use graphing calculators and computer spreadsheets to graph and analyze functions
 - 2.11.8.B - Describe the concept of unit rate, ratio, and slope in the context of rate of change

Related Lessons & Activities

Lessons

- Quantify It; Convert It; Forces, Forces Everywhere; Torqued, Energetically Challenged

Activities

- Construct a Car, Quantify It, Convert It, Dragged Racers*, Spinners*, Max Your Ride*

* included in Multimedia Support

Multimedia Support

Most lessons and activities have associated Powerpoint presentations or worksheets. See the related lessons for these files.

Dragged Racers, Spinners, and Max Your Ride activities are contained in DataStudio workbooks which contain instructions, demonstrations, and examples of applications, which may be helpful illustrations even if a PASCO setup is not possible. Make sure to keep the DataStudio-related folder intact for all clips to function properly.

chedda_456_activity_worksheets.zip

Time Required

2 hours per week over course of 10 weeks

Owner

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