Drexel-SDP GK-12 ACTIVITY

Activity: Quantify It

Subject Area(s) Measurement, Number & Operations

Associated Unit Forget the Chedda!

Associated Lesson Quantify It

Activity Title Quantify It

Grade Level 7 (6-12)

Activity Dependency
Construct A Car

Time Required 45 minutes

Group Size 2

Expendable Cost per Group US$0

Summary

Students will measure classroom objects and quantities related to their mousetrap car as they follow the included worksheet. These exercises may also serve as a primer for using the PASCO Explorer GLX unit with the Motion and Force sensor accessories.

Engineering Connection

When analyzing a model, Mechanical Engineers draw diagrams to illustrate and understand the loads that cause motion or deformation. Sometimes a diagram that shows forces and dimensions of component parts is sufficient to calculate a solution, but computer simulations may be used in the case of complex models. These complex models must be accurately described and loaded into the simulation as a *drafted* diagram, which can be scanned by high-tech laser techniques or designed using low-tech computer-aided drafting (CAD) software with measurements assessed using a micrometer or vernier caliper.

Keywords

measure, classroom object, car, distance, force, English unit, metric unit, SI unit, MKS

Educational Standards

- PA Science:
  - 3.1.7 – Unifying themes
- PA Math:
  - 2.1.8.D – Apply ratio and proportion to mathematical problem situations involving distance, rate, time, and similar triangles
  - 2.3.5.D – Convert linear measurements within the same system
  - 2.3.8.A – Develop formulas and procedures for determining measurements
  - 2.4.5.B – Use models, number facts, properties, and relationships to check and verify predictions and explain reasoning

Pre-Requisite Knowledge

Learning Objectives

After this activity, students should be able to:

- Measure distance in appropriate unit lengths in imperial or metric systems.
- Use the concept of dividing unit lengths to measure distances
- Measure and calculate an average rate

Materials List

Each group needs:

- “Quantify It” worksheet
- Measuring tape(s)

To share with the entire class:

- Meter stick
- Stopwatch

Introduction / Motivation

[Continue from lesson] You may use the measuring tapes marked in inches and centimeters and/or millimeters to measure the objects whose distances you just estimated (whiteboard length, chalk ledge width, desk height, calculator length). Record the actual measurements on your worksheet and compare it to your estimate. If you were off, did you expect those lengths to be longer or shorter?

You will note that there are some additional measurements – parts of your mousetrap car. Measure the diameters of the drive wheels and axle. You can also calculate the average speed of your mousetrap car if you know the distance it travels in a certain time:

$$v_{avg} = \frac{\text{distance}}{\text{time}}.$$

Procedure

Background

The measurements recorded in this activity are intended to provide practice while obtaining meaningful data for upcoming activities.

Before the Activity

- Set aside several measuring tapes.
- Set up station with meter stick and stopwatch to calculate average velocity.

With the Students

1. Distribute measuring tapes
2. Help students run cars and calculate velocity

Attachments

chedda_2_activity_quantify_it_worksheet.pdf

Troubleshooting Tips

- If mousetrap cars slip, duct tape can be wrapped around the wheels to provide a temporary fix. Otherwise, the car might need to be rebuilt with different parts.

Owner

Drexel University GK-12 Program

Contributors

John C. Fitzpatrick, Mechanical Engineering and Mechanics, Drexel University

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