11.125 Introduction to Education: Understanding and Evaluating Education
Spring 2009

Technologies for Learning - Velocity and Acceleration

The goal of this unit is to understand how different technologies and approaches can contribute to the understanding of velocity and acceleration. You will be using several different versions of the same experiment to learn first hand how these media affect the learning process. As you conduct your experiments you should also be considering implementation and curricular issues such as:

- how the different media could be combined to enhance student learning, and in what order you might present them
- what time and material constraints might dictate your choice of one medium over another
- which media you would choose for different types of learners
- what your particular learning goals are for your students.

The experiment that you will be doing is a classic physics experiment in which you roll a cart down an inclined plane. In this experiment you will investigate how the angle of the inclined plane affects the velocity and acceleration of the cart. Specifically, you will be answering the following questions:

- How does the angle of the inclined plane affect the distance that the cart travels once it leaves the plane?
- What happens to the velocity and acceleration of the cart as it proceeds down the plane and then onto the floor?
- How does friction affect the outcome of the experiment?
- Where does the cart hit maximum velocity and acceleration? What factors influence the velocity and acceleration?

At the end of each experiment you should be able to describe a theory that explains the velocity and acceleration of the cart as it proceeds down the ramp, how these are affected by the angle of inclination and predicts the distance that the cart travels after it leaves the ramp.

The four approaches that we will be using are:

1. Rolling a cart down an inclined plane. You will measure velocity and acceleration using a stopwatch and a ruler.
2. Rolling a cart down an inclined plane. You will measure velocity and acceleration using the sonic ranger that continuously outputs data to the computer.
3. Using the Explore Learning simulations to simulate rolling a cart down an inclined plane.
4. Designing your own experiment based on Matchbox cars and track.

Instructions for using the sonic ranger, the Interactive Physics program and the Stella modules are provided here.

Sonic Ranger

Follow the instructions for the Motion Sensor. You can find the instructions here for the Motion Sensor and here for the USB Link.

Explore Learning Simulations

There are three simulations at the Explore Learning site that deal with velocity and acceleration that have been selected for this activity (requires Shockwave). They are:

- Roller Coaster Physics
- Inclined Plane
- Ants on a Slant

These, along with instructions can be found on the class Explore Learning Page.

You may also try these two free simulations (require Java):

- Jersey Cow
- Inclined Plane

Non-Electronic Labs

In addition to the two electronic labs (simulation and probes) there are two versions of the lab that are to be conducted without technology. The first is simply timing a cart rolling down the inclined plane at different angles to compute velocity and acceleration. The second provides you with track and matchbox cars and asks you to design your own experiment with these same learning goals.