Accelerated Car Activity (Student)

In groups of 3, you will accelerate a block or toy car using a rubber band rope. You will collect data using an app and then graph position-time and velocity-time graphs in order to analyse the motion of the object.

Pre-Activity Questions

1. What will be the motion of the device? Sketch the position vs. time graph you expect for this motion.
2. Will the velocity of the device ever be negative? Sketch the velocity vs. time graph you expect for this motion.
3. Will the acceleration of the device be constant? Will the acceleration ever be negative?

Group Materials

- Mobile phone or tablet
- Vernier Video Physics app
- Elastic bands
- 200-500 g block or toy car, approximately the size of a blackboard eraser
- A track -- books, boards, boxes, Styrofoam, or other materials with which to make barriers
- Books or other weights to hold the elastic rope taut.

Instructions

1. Create a horizontal track, at least 5 m long. You will want to make sure that the track is straight, with barrier walls set up along the width of the device so that it neither flies off course nor is damaged.

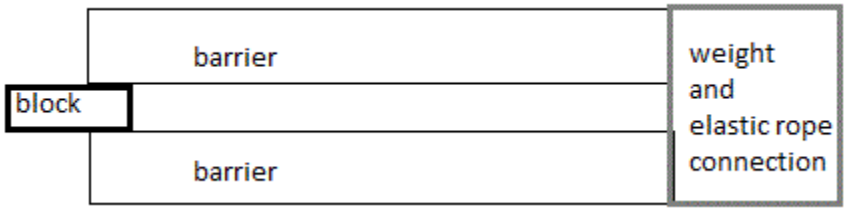

Figure 1: The experimental set-up for the activity.

2. Attach the loose end of the rubber band string around the perimeter of the block (or car). You may need to tape the elastic in place.
3. Begin recording using the Vernier Physics app.
4. Release the device, allowing the rubber band string to accelerate the device down the track.

Analysis

5. Record the position vs. time data in a table and create a scatter plot from this data.
6. Calculate the velocity vs. time data, record it in a table and create a scatter plot.
7. Calculate the acceleration vs. time data, record it in a table and create a scatter plot.

Discussion

A. Does your data agree with your predictions as made in the Introductory Questions? If not, why not.

B. In what way could you improve or modify this experiment to demonstrate constant acceleration?

C. What are some specific sources of error in this experiment? How could you improve the experiment to reduce (or eliminate) these sources of error?

This activity is adapted from

https://www.teachengineering.org/view_lesson.php?url=collection/uno_/lessons/uno_accelerometer/uno_accelerometer_lesson02.xml.