AN INQUIRY INTO FORCES

Ref: Wyrembeck, E. P. (2005). "Using a Force Plate to Correct Student Misconceptions", *The Physics Teacher*, v43, September, p384.

INTRODUCTION

This is an inquiry lab where you are asked to form groups of 2-5 students and discuss a question. You will then come to a conclusion/prediction and design an experiment to confirm your conclusion.

MATERIALS AVAILABLE

Vernier Force Plate	At least two objects to throw at the door
Meter stick	(such as a basketball and a ball of modeling clay)
Computer with Logger Pro 3.3 (or higher)	

THE QUESTION

You are sitting in your room and realize that the door to your cupboard is open. You decide that you would like to have it closed. There is no need to discuss why you would prefer it closed. Since you have too much inertia at the moment to get up and close the door yourself, you decide to throw something at the door in order to close it. What will you throw at the door? It may be good to ensure that everyone in your group has a clear understanding of Impulse, Momentum and Kinetic Energy.

PROCEDURE

1. Break into groups and discuss the question and possible solutions.

2. Develop a hypothesis or prediction as to what method will close the door and why.

3. Design an experiment or test, using the Vernier Force Plate, to determine if your hypothesis should be accepted or rejected.

4. Obtain instructors approval before actually conducting the test.

5. Set up the Force Plate as follows:
   a) Set the force plate on the low range setting (-200/+850N)
   b) Secure the force plate to the lab bench or possibly to a wall
   c) Be sure the force plate is powered and connect to a computer
   d) Open the Logger Pro software (3.3 or latter) and set the rate to 20,000 samples /s
   e) Set the experiment length to 0.600s and trigger the plate to start collecting data when force exceeds 2.00N
   f) Ensure that the program is set to graph force in Newton's vs. Time in seconds

5. Drop the objects (from the same height) or throw with the same acceleration on to the force plate and obtain the force vs. time graph

6. Analyze the graphs using the "Analysis" menu to determine the range of impulse values ($\int Fdt$) for the first collision.

7. Average the values for the various trials to get the final value.

8. If possible print at least the graphs for one trail of each object.

CONCLUSION

Your group should discuss all the data you have collected and decide if your original prediction or hypothesis should be accepted or rejected.

Following this you need to compose a statement of your decision that will explain why you came to that decision.

EXTENSION

Use the data you have collected to validate the impulse-momentum theorem. ($\int Fdt = m\Delta v$)