Experimental Design III

To begin, you will give a brief report on the experiment you did last week. What did you hypothesize, what did you observe, what are your conclusions? Should you have done anything different? Did anything surprise you? Do your results suggest new experiments?

The Pendulum

We will experiment with pendulums today. I have given you a modified version of the 4 questions strategy. The version I gave you last week works better at lower grade levels; today’s version is closer to Cothron’s and is better for higher grade levels, when students already have some understanding of the experimental process.

Any Physics majors in the course will act as Teaching Assistants for this lab. They may answer general questions and make suggestions about your experiment, but not provide detailed answers or equations.

I will give you 10 minutes to complete the 4 questions and design an experiment, and another 20 minutes to carry out your experiment.

After that, I will give you a Task. The Task will be to construct a pendulum that behaves in a way that I will describe. You will be given 5 more minutes to construct your pendulum. You be allowed to use the data you have collected and one measuring device of your choice (e.g., meter stick, protractor, compass, balance, thermometer, barometer) to construct your pendulum. No timers allowed! Your student teaching assistants will monitor you very carefully to ensure compliance with the rules.

At the end of the 5 minutes, all work will cease. You will hand your work, with your printed names on it, to me or a student teaching assistant. Student teaching assistants will then use precision measuring devices to see how well your pendulum accomplishes the given Task.

Grading

You get full credit for completing this lab even if your pendulum fails miserably at accomplishing the Task.

As a reward for coming to lab on this snowy late afternoon, I have some little prizes for the team that comes closest to accomplishing the Task.
Experimental Design III: The Pendulum

Experimental design using the Four Question Strategy (Cothron, Giese, and Rezba, Students and Research, 2000). (Web: http://www.kendallhunt.com, search for “Cothron.”)

Choose a topic you are interested in doing experiments on: __________________________, and then write the topic in the blanks to questions 1-4. **We will do a pendulum.**

1. What does _____________________ act?
A pendulum swings. Let’s just stop at that.

2. What materials are readily available for conducting experiments on __________________________. **List materials available to conduct experiments on a pendulum.**

3. How can I CHANGE the set of _____________________ materials to affect the action? **Choose several items from question 1 that you could change. Put each item at the head of a column. Below, list several ways you could change each item.**

4. How can I MEASURE or describe the response of _____________________ to the change? **Choose one of the “acts” responses from question 1. Write it down and underline it. Underneath, write down one or more ways you could measure the action. You may repeat this for several of the “acts.”**
Circle one of the “acts” in question 1, one of the “changes” in question 3, and one of the “measurements” in question 4. Congratulations! You have completed the outline of your experimental design!

Experimental Design

Title:  The effect of  _IV (from 3 on page 1)_ on  _DV (from 4 on page 1)._ 

Hypothesis:  Any one of these three…
If I ___change to make___ the ___independent variable___ then ___change predicted___.
If the ___independent variable___ affects the ___dependent variable___ then ___change predicted___.
If the ___IV___ is increased/decreased then the ___DV___ will increase/decrease/stay the same.

Independent Variable:  The item you circled in question 3 on page 1.

Dependent Variable:  The “measure” item you circled in question 4 on page 1.

Constants:  Everything you wrote down in question 3 on page 1, except for the one item you circled and chose as your independent variable.
Procedures for Conducting an Experiment on:

___________________________________

Fill in the blank with your title from page 2. Refer to your independent and dependent variables. List the steps you will take to change your independent variable, and how you will measure your dependent variable.

A lengthy, complex experimental procedure is not necessarily a good one!

A simple, to-the-point experiment that provides a clear result may be better than a complex experiment that provides confusing results!
Conclusion Questions (not required today)

1. What was the purpose of this experiment?

2. What were the major findings?

3. Was the research hypothesis supported by the data? Give evidence.

4. What possible explanations can you offer for the findings?

5. What recommendations do you have for further study and for improving the experiment?