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Using TI Calculator as Data Collector

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Generic Lesson Plan Template

You should submit this form in addition to any computer generated files/documents/models to your group folder on Angel. Please create a .zip file and upload the group of files as a single archive.

Name: **Bruce Peachey**
Grade level(s)/Subject taught: **12/Physics**
Objectives: **Students will become familiar with using their graphing calculators as data collection devices.** **Students will explore the relationship between displacement, velocity, and acceleration and be able to relate characteristics of each of them graphically.**

Please provide a rich **one-page, single-spaced**, description or a *vision* of your best thinking on a way or ways you might teach the planned lesson. (approximately ½ page for the teacher role, ½ page for the student role). Also, construct a tentative rubric that you might use with your students (see example)

Items to include in your lesson plan: (Choose your discipline/concepts from your own area).

1. *Write* the Mathematical Concept or "key idea" that modeling will be used to teach: (e.g. Students use mathematical modeling/ multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships)

The rate of change of the vertical axis variable with respect to the horizontal axis variable can be seen as the slope of the line. Things that change at a constant rate produce graphs with constant slopes, and these graphs are therefore straight lines. Quantities that change at a variable rate produce curved plots.

and/or…

1b. *Write* the Science Concept or "key idea" that modeling will be used to teach: (e.g. Organisms maintain a dynamic equilibrium that sustains life).

The rate of change of displacement is velocity, and the rate of change of velocity is acceleration. Each rate can be seen by the slope of the graph of the quantity changing vs. time. Acceleration shows up as curvature on the displacement-time graph, because the rate (velocity) is changing, and therefore the slope.

Materials:

"…a rich **one-page, single-spaced**, description or a *vision* of your best thinking…"

Prompts:

1. How will you assess the prior knowledge of the student?
2. How will you begin the lesson?
3. What are the teacher and students doing every 5-10 minutes? (Teacher Actions and Student Actions
4. How will you assess the learning for the lesson?

Using _Vernier Motion Detector, TI calculator, & Logger Pro 3 software__ I plan on having my students…
(software / modeling package(s)

<u>The activity</u>:
Walk in a straight line toward the motion detector at a steady speed, then walk away from it at a steady speed. Import the data into the computer and analyze it using Logger Pro 3. Look at the displacement-time graph, velocity-time graph, and acceleration-time graph. For selected time intervals, note what each graph is doing, and how they relate to each other. For example, constant-velocity motion should show up as a straight line whose slope is velocity on the displacement-time graph, a horizontal line at the value of the velocity on the velocity-time graph, and a horizontal line at zero on the acceleration-time graph. Have the students find maximum and minimum values, and discuss the relationships they find.

Then repeat the activity while attempting to accelerate at a constant rate, and analyze the graphs and relationships among the data again. Discuss the differences between the graphs for the two cases, and why they came out the way they did.

1. **Students will have already received instruction on some of the basic principles of kinematics and relationships between its variables. They will also have had practice graphing various things, including motion. They will also have already completed the Moving Man activity outlined in my previous lesson plan, so they will have experimented with motion graphs.**

2. **I will begin the lesson by revisiting some of the discussions and concepts we've already covered regarding motion and graphing. I will inform the students that we will now combine these two ideas, and that the data we collect will be generated by ourselves. I will show them how to make the necessary connections, and get the right program open on their calculators. We will make sure to add the program to the calculators prior to the start of the lesson.**

3. **Beginning the lesson, and receiving instruction. Preparing the calculators and computers, and setting up the equipment. Then, collecting data, and solving problems associated with this. After the data is collected, transferring it to the computer. Then, analyzing the data using Logger Pro, and ultimately looking at the graphs, gathering the necessary information, and discussing and recording their findings.**

4. **Assessment will be ongoing once the students are on their own. Conversations with them regarding their findings, and their predictions, will help me learn how well they understand the material. Ultimately, they will submit a laboratory report which will ask them specific questions about what they have done, what it means, and why it came out the way it did. Later, the material they learn will be covered on a quiz and a test.**