In Class Activity Plan

Week six: Becoming Quantitative with Energy

120 min **Investigating Energy Conservation (**[**Word**](investigating_energy_conservation.docx)**,** [**Pdf**](investigating_energy_conservation.pdf)**)**

PURPOSE: Introduce equations for Eg and Ek, opportunity to design experiment

*Teaching Notes:*

* You should whiteboard after the first page (making pie charts).
  + Goals here will be to push them towards the answers to the questions on page 2.
  + Suggest energy at the top should be proportional to both mass and height.
* For many students this will be the first time they have ever had to design their own experiment. So this lab will both take a long time, and be difficult for some students.
  + The proposal must have a model associated with it, and must identify what measures are going to be made and how the data is going to be analyzed.
  + Also, the teacher must be very good at evaluating experiments on the fly. They may think of things that would work, but we haven’t thought of before.
* Possible experiments:
  + Drop the ball from different heights and record the speed at the bottom. They can then make a graph of EIg and Ek and get a linear fit.
  + Also a possibility of rolling things on rails and measuring speeds.

20min **Whiteboard – Investigating Energy Conservation**

PURPOSE: Share experimental designs and results for equations for Eg and Ek

Video Example: ([Whiteboarding](../../video/week6_1b_1.html))

1. What did you learn?
2. What rules can you make?
3. What questions do you still have?

45min **Board Meeting**

PURPOSE: Compare experimental designs and results for Eg and Ek, reach consensus about how to calculate Energies.

Video Examples: ([Discussion1](../../video/week6_1d_1.html), [Discussion2](../../video/week6_1d_2.html), [Discussion3](../../video/week6_1d_3.html))

* Need to define system (Schema)
* Use pie charts to help you determine what needs to be measured
* Strategy 1
  + EIgo – EIgf
  + Plot Ek vs. v
  + Fit a curve in Excel
* Strategy 2
  + EIgo = magh
  + Ekf = m (Δv/Δt)( ½ag(Δt2))
  + Ekf = m (Δv/Δt)( ½(Δv/Δt)(Δt2))
  + Ek = ½mv2
  + Must be supported by data!
* Energy Pie Charts are a representation of the Equation of Everything (energy conservation)

20 min **Whiteboard - 1-d problem using both kinematics and energy conservation**

PURPOSE: Compare and contrast strategies for making calculations on constant a model using kinematics and energy;

*Problem:*

Cubs fan throws his hat straight into the air at 7m/s.

10 min **Board Meeting**

PURPOSE: Show how basic constant a models obey energy conservation and give same results.

Emphasize energy as an easy approach that works well in some situations.

60 min **Whiteboard - Redo 2-d problems they’ve already done now using energy &/or additional problems**

*Energy Pie Chart Problems (*[*Word*](energy_pie_chart_problems.docx)*,* [*Pdf*](energy_pie_chart_problems.pdf)*)*

*Energy Problems for Practice (*[*Word*](energy_problems_for_practice.docx)*,* [*Pdf*](energy_problems_for_practice.pdf)*)*

Video Examples: ([Whiteboarding](../../video/week6_3b_1.html), [Discussion](../../video/week6_3d_1.html))

Note: These are often done, but not discussed in a board meeting since they have done them previously.