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2. Valley Stream South H.S.
3. 11th – 12th grades
4. Regents Physics / AP Physics

5. CCLS Standards Addressed

ELA/Literacy -

RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Mathematics -

MP.2	Reason abstractly and quantitatively.
MP.4	Model with mathematics.
HSN.Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
HSN.Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
HSN.Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
HSA.SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
HSA.SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
HSA.CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
HSA.CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
HSA.CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
HSF-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
HSS-IS.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).

6. PhET Interactive Simulations: <http://phet.colorado.edu/>
7. PhET provides fun, interactive, research-based simulations of physical phenomena for free. To help students visually comprehend concepts, PhET simulations animate what is invisible to the eye through the use of graphics and intuitive controls such as click-and-drag manipulation, sliders and radio buttons. In order to further encourage quantitative exploration, the simulations also offer measurement instruments including rulers, stop-watches, voltmeters and thermometers. As the user manipulates these interactive tools, responses are immediately animated thus effectively illustrating cause-and-effect relationships as well as multiple linked representations (motion of the objects, graphs, number readouts, etc.).

All PhET simulations are freely available from the [PhET website](http://phet.colorado.edu/) and are easy to use and incorporate into the classroom. Unfortunately, the majority are written in Java and Flash, and can only be run using computers that have Java and Flash installed. So Chromebooks are only able to run the Flash-based simulations, while tablet and phone users are unable to access any of the simulations. However, a recent initiative has started to convert the simulations into HTML5, which is able to run in the browser of iPads and smartphones. The list of available simulations is slowly growing.

The best part of the website is that there is also a community of teachers that upload worksheets designed around the simulations in mind, which are freely shared and available to all.

8. For use in the classroom, I occasionally treat the simulations as either a demonstration to help illustrate various concepts, although they are best used as a hands-on activity, either in the classroom or at home. I am able to do this as a classroom activity because my class possesses a class set of Chromebooks. With lab sheets pre-made by other teachers, I simply need to modify the worksheets according to my needs and give each student free rein to work through the simulation on their own. By allowing them to interact with the simulation and make mistakes, it gives the students a more intuitive understanding of the concepts as compared to simply drawing the concept on the board.

I would like to mention that with the advent of Windows 8.1 tablets, all the Java and Flash simulations would be available since a Windows 8.1 tablet would have all the necessary pre-installed.