Introduction

“I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the sea-shore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.”

“I can calculate the motion of heavenly bodies but not the madness of people.”

“Tact is the knack of making a point without making an enemy.”

“If I have been able to see further, it was only because I stood on the shoulders of giants.”

All of these quotes are attributed to Sir Isaac Newton, who may or may not be the greatest scientist in history. This webquest is designed to help you decide for yourself how you feel about Sir Isaac and his contributions to physics. How far-reaching is his influence? What were his contributions, exactly? Are they still relevant today? Why? Jot down your impressions of these quotes. To what do you think Newton was referring?

Tasks

You will research Isaac Newton's life and times and his physics. You will develop an understanding of Newton's Laws of Motion and will evaluate his contributions to modern science. You will apply the concepts of Newton's Laws of Motion to a series of problem-solving tasks. You will also demonstrate your understanding of Newton's Laws by creating an artifact that illustrates your conceptual understanding.

Process

1. What do you think? Is it an exaggeration to identify Isaac Newton as one of the greatest scientists in history? You will use the sources below to research Newton's life and contributions before developing an opinion. Once you have chosen your position, you will write an evaluative mini-essay (less than one page) that details and defends your assessment of Newton as a scientist.

   - http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Newton.html
   - http://web.clas.ufl.edu/users/ufatch/pages/01-Courses/current-courses/08spring/newton.html
   - http://plato.stanford.edu/entries/newton/

   (You probably won't have time to watch the entire video in class)
   - http://www.newton.ac.uk/newtlife.html

   The Newton Project
   - Chymistry
   - Newton, the Polymath

2. You will develop an understanding of Newton's Laws of Motion by completing the following tutorial pages and working example problems. There are 3 different accompanying worksheets that go with this section—one with Forces and Motion, one with Galileo's Experiments, and one with Bumper Cars. Be sure to complete each one. After you complete the entire tutorial, you will create an artifact that demonstrates your understanding.

   - Forces and Motion: Use the pHet simulation to solidify your understanding of the relationship between forces and motion. Get the accompanying worksheet from Mrs. Kreutter; the file is also attached below.
   - Newton's First Law: Click on Galileo's Experiments and complete the accompanying worksheet. This is an online simulated lab; the worksheet is to aid your data collection. Be sure to perform both experiments.
   - Newton's Third Law: with bumper cars! Click on "Colliding Cars" to perform the experiment when you get to the appropriate webpage. Again, there is an accompanying worksheet.
   - Newton's Second Law: Part 2--Force Diagrams
   - Newton's Second Law: Part 3
   - Newton's Second Law Problem
   - SolvingNewton's Second Law and Free-Fall
   - But what do cats have to do with it?
   - Newton's Third Law
   - Forces come in Pairs

   You are required to submit the following: 
   - Evaluative mini-essay on Newton's contributions and reputation (See Rubric)
Forces and Motion worksheet (pHet Simulation)&nbsp;| Galileo's Experiments worksheet&nbsp;| Bumper Cars worksheet&nbsp;| Some artifact of your choice that chronicles/showcases your understanding of Newton's 3 Laws of Motion (See Rubric)

<table>
<thead>
<tr>
<th>Category and Score</th>
<th>Beginning</th>
<th>Developing</th>
<th>Proficient</th>
<th>Advanced Proficient</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essay Evaluating Newton's Contributions and Reputation</td>
<td>Paper is not evaluative. Little evidence of thought or effort.</td>
<td>Paper offers some evaluation but is not complete; evaluation is directly lifted from sources.</td>
<td>Paper is thoughtful and complete but may not consider multiple points of view or sources.</td>
<td>Paper is thoughtful and complete; evaluation is clearly student's own and shows evidence of multiple sources.</td>
<td>10</td>
</tr>
<tr>
<td>Worksheets</td>
<td>No worksheets included</td>
<td>Some worksheets missing and/or incomplete.</td>
<td>All worksheets are completed with minor omissions and/or errors.</td>
<td>All worksheets are completed with evidence of thought and effort.</td>
<td>10</td>
</tr>
<tr>
<td>Newton's Laws Artifact</td>
<td>Artifact missing or shows no relevance and/or connections to Newton's Laws.</td>
<td>Artifact demonstrates a rudimentary understanding of aspects of Newton's Laws but lacks evidence of thought and effort.</td>
<td>Artifact illustrates an understanding of Newton's Laws and makes some attempt to connect them to student's own life experiences in a meaningful way.</td>
<td>Artifact illustrates understanding of Newton's Laws and connects these to student's own life experiences in a way that is meaningful, thoughtful, and entertaining.</td>
<td>35</td>
</tr>
<tr>
<td>Participation</td>
<td>Obvious lack of interest in project.</td>
<td>Some interest/application but class time not used effectively.</td>
<td>Student demonstrated effective use of class time for the most part.</td>
<td>Student demonstrated effective use of class time and engagement in the material/project.</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total Score</td>
<td>60</td>
</tr>
</tbody>
</table>

**Conclusion**

How has your impression of Isaac Newton changed? Are you surprised by anything that you learned (I am thinking about his study of and commitment to alchemy. If you did not explore those resources, be sure to check this out (Chymistry). Do you better understand Newton's quotes that were highlighted at the beginning of this webquest? How have some of your interpretations of those quotes changed? To end this webquest, find a partner and share your essay and your artifact. &nbsp;Is your partner's assessment of Isaac Newton's contributions to science similar to yours, or quite different? What about their personal interpretation of Newton's Laws as presented in the form of their artifact? Do you feel that the two of you had the same experience during the Webquest? Did you stumble upon other contributions Isaac Newton made? Things like his Law of Universal Gravitation (How do orbits work, anyway?)&nbsp;and his contributions to optics? If you're even more curious about Isaac Newton and the scientists that either influenced or were influenced by him, visit some of the following. I hope you found that the history of science can be fascinating stuff!GalileoCopernicusLeibnizDescartesGavendishFaradayMaxwellMaxwell's ImpactEinstein

**Teacher Page**

This webquest is an introduction to Newton's Laws of Motion in addition to an introduction to Newton within the context of his place and time. &nbsp;The history of science is important and something we teachers often don't have time to directly address so I wanted to be sure students got a taste of what came before and after Newton and why Newton is considered one of the greatest contributors to modern science. &nbsp;This webquest is designed to take my group of high school physics students (juniors and seniors, but introductory level) three days of class time to complete.

**Standards**

From NJCCCS for Science (2009):

5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.

A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.

D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.

5.2.12.E.3 The motion of an object changes only when a net force is applied.

5.2.12.E.4 The magnitude of acceleration of an object depends directly on the strength of the net force, and inversely on the mass of the object. This relationship (a=Fnet/m) is independent of the nature of the force.

**Credits**
This Webquest is a way to integrate the much appreciated pHet simulations (http://phet.colorado.edu/) and The Physics Classroom tutorials (http://www.physicsclassroom.com/). I also heavily borrowed from Sean Sand's Quest Garden Webquest (http://www.questgarden.com/86/07/1/100228175329/).

Other