Lesson Title: 3-2-1 Blast Off With Newton

Unit: Motion & Newton

Grade Level: 7-8

Estimated time requirement: Three to five class periods

Summary (25-50 words): Students attempt to apply Newton's laws of motion in order to construct and launch bottle rockets.

Objectives:

- Calculate speed, velocity, and height
- Describe Newton's first law
- Predict changes in motion using Newton's second law
- Interpret motion using Newton's third law
- Analyze motion using all three laws

Content Standards: Texas Middle School Science Grade 8
http://www.tea.state.tx.us/rules/tac/chapter112/ch112b.html

- 8.1 The student conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices.
- 8.1A The student is expected to: demonstrate safe practices during field and laboratory investigations
- 8.2A The student is expected to: plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting and using equipment and technology
- 8.2B The student is expected to: collect data by observing and measuring
- 8.2C The student is expected to: organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence
- 8.2D The student is expected to: communicate valid conclusions
- 8.2E The student is expected to: construct graphs, tables, maps, and charts using tools including computers to organize, examine, and evaluate data.
- 8.3 The student uses critical thinking and scientific problem solving to make informed decisions.
- 8.3A The student is expected to: analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information
- 8.3E The student is expected to: connect Grade 8 science concepts with the history of science and contributions of scientists.
- 8.4 The student knows how to use a variety of tools and methods to conduct science inquiry.
- 8.4A The student is expected to collect, record, and analyze information using tools including beakers, petri dishes, meter sticks, graduated cylinders, weather instruments, hot plates, dissecting equipment, test tubes, safety goggles, spring scales, balances, microscopes, telescopes, thermometers, calculators, field equipment, computers, computer probes, water test kits, and timing devices:
- 8.4B The student is expected to: extrapolate from collected information to make predictions
- 8.5B The student is expected to: design and test a model to solve the problem
- 8.7 The student knows that there is a relationship between force and motion.

Texas Technology Applications Grade 6-8

http://www.tea.state.tx.us/rules/tac/chapter126/ch126b.html

- 1: The student demonstrates knowledge and appropriate use of hardware components, software programs, and their connections. The student is expected to:
- 1A: demonstrate knowledge and appropriate use of operating systems, software applications, and communication and networking components
- 1C: demonstrate the ability to select and use software for a defined task according to quality, appropriateness, effectiveness, and efficiency
- 1F: perform basic software application functions including, but not limited to, opening an application program and creating, modifying, printing, and saving documents
- 2: The student uses data input skills appropriate to the task. The student is expected to:
- 4: The student uses a variety of strategies to acquire information from electronic resources, with appropriate supervision.
- 5A: The student is expected to: identify, create, and use files in various formats such as text, bitmapped/vector graphics, image, video, and audio files
- 7B: The student is expected to: create and edit spreadsheet documents using all data types, formulas and functions, and chart information
- 7D: The student is expected to: demonstrate proficiency in the use of multimedia authoring programs by creating linear or non-linear projects incorporating text, audio, video, and graphics
- 11A: The student is expected to: publish information in a variety of ways including, but not limited to, printed copy, monitor display, Internet documents, and video

Assessment:

- Students effectively recognize Newton's laws with the launches
- Correctly calculate of height and velocity of each launch
- Proper completion of spreadsheet and graphs Completion of lab activity through successful plotting of height, air, and water amounts
- Successful download and posting of videos

Materials:

- Review Newton's laws with "3-2-1 Blast Off With Newton" PowerPoint
- Altitude Tracker Instruction
- Bottle Rocket Experiments
- Materials for Water Rocket Construction
- Materials for Altitude Tracker
- 2-Liter plastic pop bottle
- Various materials to construct fins and attachments
- Timers
- Excel
- Digital Still and Video Camera
- TI 84
- LCD
- Internet
- Imagination

Resources:

- Loose in the Lab "Water Rocket" construction instruction
- www.eduref.org

- NASA Glenn Learning Technologies Project www.grc.nasa.gov
- Glencoe Texas Science Grade 8

Prior Knowledge/Skills: Previous usage of Excel, TI 84, internet, and cameras. Background on Newton's Laws

Procedures:

- Review Newton's Laws of Motion with PowerPoint presentation
- Construct a Launch Recording Data Sheet using Excel; show the instructions on the LCD projector
- Construct Water Rocket Launcher; show the instructions on the LCD projector
- Make a Altitude Tracking device; show the instructions on the LCD projector
- Perform "Bottle Rockets Experiments"
- During the launches, have various students film with the digital video camera and photograph with the digital still camera
- After completion, students post videos and photographs on teacher website and display for the class on the LCD projector

Modifications:

- Pre-group students to help with time management.

Technology Infusion:

- Digital Still and Video Camera , TI 84 Calculator, Excel, Internet

Cultural Connections:

- Students introduced to brief history of rockets in PowerPoint

Family Connection:

- View the website at home to show parents and guardians the videos and pictures