DataSnap™ Impact Experience

Curriculum Overview

Designed for:

- Middle school students in career exploration, engineering, or science courses

Length:

This seven-hour curriculum is comprised of five lessons. With supplemental materials, this curriculum can be adapted to a longer block of time. You can also select individual lessons or activities to use in your current curriculum.

Goal:

To modernize the classic Egg Drop Engineering Design Challenge, bringing standards-driven content to life with easily accessible motion data.

Synopsis:

The DataSnap Impact STEM Lab and its curriculum allow students to learn, explore, and design solutions to engineering challenges while useing the DataSnap Motion Sensor to conduct repeated test trials and evaluate their designs. Students will be introduced to foundational concepts of motion through hands-on exploration and real-world examples. The lessons and activities feature objectives, materials required, and approximate class time.

Curriculum Components:

- Curriculum
- Student materials
- Slide presentations
- Stident Engineering Workbook

Learning Objectives:

Lesson 1 – Distance and Time

- Explain the concepts of motion, distance, and time and identify real-world examples that show how they relate to one another
- Use the DataSnap Motion Sensor and app to collect and view motion data following proper motion-trigger procedures
- Conduct a drop time investigation, gathering distance and time measurements from multiple trials
- Analyze and interpret data to identify patterns and describe how changes in distance affect the time it takes an object to fall

Lesson 2 – Speed and Velocity

- Define and distinguish speed and velocity, recognizing that velocity includes both rate and direction
- Identify real-world examples of speed and velocity and classify measurements as one or the other
- Use the DataSnap Motion Sensor to collect drop velocity data across multiple heights
- Analyze motion data to determine minimum and maximum velocity and explain how drop height influences velocity

Lesson 3 – Acceleration and Gravity

- Define acceleration and explain how changes in speed or direction indicate that a force is acting on an object
- Describe gravity as a universal force that accelerates all objects during freefall at a predictable rate
- Use the DataSnap Motion Sensor to collect freefall data, including distance, time, velocity, and acceleration across multiple drop heights
- Analyze motion graphs to identify freefall acceleration, examine velocity changes, and interpret how position evolves during a drop

Lesson 4 – Forces and Newton's Laws

- Explain mass, force, and inertia
- Describe Newton's 3 Laws in the context of real-world motion and collisions
- Prepare, assemble, and use the Impact Ship with the DataSnap™ Motion Sensor to collect impact force data from controlled drop tests
- Analyze how drop height influences impact force by comparing data across multiple trials
- Evaluate and propose engineering design improvements that could reduce the impact force experienced by the sensor

Lesson 5 – Protect the Astronaut

- Apply the Engineering Design Process to plan, prototype, and refine a safe landing strategy for the Impact Ship
- Use prior knowledge of velocity, gravity, and impact force to inform design decisions and justify engineering choices
- Collect and analyze impact force data using the DataSnap Motion Sensor to evaluate how well their design protects the "astronaut"
- Test, compare, and iterate design solutions, identifying improvements based on results and observations from multiple trials

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