Fiona Flannagan Purveyor of Fine Firefighting Equipment

A Virtual Learning Program Presented by the FASNY Museum of Firefighting Educator's Overview

FASNY
MUSEUM OF FIREFIGHTING

Fiona Flannagan Purveyor of Fine Firefighting Equipment

Students will travel back in time and meet their hostess, Fiona Flannagan, a young Irish immigrant. Fiona will use her very best sales tactics, including jokes and sound effects, to lead your students through an interactive lesson about simple machines and how they work. Using Fiona's guidance, and their budgeting worksheet, students will decide which pieces of fire equipment will be the best fit for their firehouse. They will learn how each simple machine is used and be able to identify them in everyday objects. This rich, interdisciplinary program will be an experience your students will not soon forget!

Overview of Key Program Components:

Part 1: Introduction and setup for Program

Students will be given order forms to purchase fire equipment for their fire department. (The Museum will send the forms to the teacher prior to the program. Teachers should distribute them at the start of the program.) This form has a budget amount on it, so the students know how much money they have to spend. Students must listen carefully to Fiona in order to understand how each piece of equipment works, and its advantages and disadvantages. Students will follow along with the live presentation and make decisions on their worksheet in real time.

Part 2: Hand Pumpers

Simple Machines Explored: wheel and axle, levers

Key Concepts: Hand pumpers are the first and most basic type of engine used to fight fires. Hand pumpers may be basic, using a simple machine to produce suction, but they are a huge step forward from having to use a bucket brigade to put out fires. Hand pumpers are Class 1 levers. This means that the fulcrum is located in the center of the pump. On one side of the pump is the handle, where the "effort" is applied, and on the other side is the load that is sucked up out of the compartment.

Activity: Fiona will discuss the technology and engineering used to create a hand pumper. Students will view the working model of hand pumper and evaluate its advantages and disadvantages for their fire department. They must figure out if the cost of the engine, and the advantages of the engine, fit within their budget.

Part 3: Steam Engines

Simple Machines Explored: wheel and axle, levers, inclined plane

Key Concepts: Steam engines use the same basic technology as hand pumpers, but the addition of steam helps to propel water even faster and farther. The steam engine still uses a lever as its basic design. However, a steam engine utilizes steam to push and pull pistons and valves to move the water. The steam enters at one side of the steam cylinder through the slide valve and pushes the piston towards the opposite side. As the piston reaches the end of the stroke, the slide valve reverses the steam flow, which reverses the piston movement. Many steam engines also use centrifuges to spin and propel the water even faster and more efficiently.

Activity: Fiona will discuss the technology and engineering used to create steam engines. Students will view a cross section of a steam engine and evaluate its advantages and disadvantages for their fire department. They must figure out if the cost of the engine, and the advantages of the engine, fit within their budget.

Part 4: Combustion Engines

Simple Machines Explored: pulley, wedge, screw

Key Concepts: The combustion builds even further on the technology used in hand pumpers and steam engines. Combustion engines still utilize levers and pistons, but introduce fuel and fire to propel water even further and faster. In a spark ignition engine, the fuel is mixed with air and then inducted into the cylinder during the intake process. After the piston compresses the fuel-air mixture, the spark ignites it, causing combustion. The expansion of the combustion gasses pushes the piston during the power stroke. A combustion engine builds on the class 1 lever technology in hand pumpers and steam engines.

Activity: Fiona will discuss the technology and engineering used to create combustion engines. Students will view a working model of a combustion engine and evaluate its advantages and disadvantages for their fire department. They must figure out if the cost of the engine, and the advantages of the engine, fit within their budget.

Part 5: Evaluation: After Fiona finished her sales pitches students must complete their order form for their fire department. Fiona will then review the pieces of equipment and discuss some advantages and disadvantages for each selection. Students will get a review of how each of the simple machines are incorporated into fire equipment.

Pre Visit Materials:

Order Form Worksheet

To be handed out by the teacher at the start of the live program.

Fiona Flannagan: An Immigrant's Tale

This booklet introduces students to the host of the program, Fiona Flannagan. It also explores what the immigrant experience was like in Hudson, NY in the late 19th and early 20th century for Irish Immigrants.

Post Visit Materials:

Inventing Their Own Way: How race, gender and society influenced the opportunities of inventors of the past

This booklet explores lesser known inventors that, in some way, influenced technology used in the fire service. There are 5 inventors included in the booklet, and each inventor faces different successes and challenges based on their gender or race.

Identifying Simple Machines Worksheet

This worksheet contains pictures of fire equipment, and students must identify the simple machine used in the piece of equipment.

New York State Learning Standards met in this program include, but are not limited to:

MS Engineering and Design

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

New York State Next Generation Learning Standards Connections:

ELA/Literacy – 6-8.RST.1 Cite specific textual evidence to support analysis of science and technical texts, charts, graphs, diagrams, etc. Understand and follow a detailed set of directions. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)

6-8.RST. 7 Identify and match scientific or technical information present as text with a version of that information presented visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ETS1-3)

Mathematics – MP.2 Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4)

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