CCC! Core Curriculum Content

STREAMING MEDIA

Teacher's Guide

The Jet Engine

Inventions that Shook the World Series

Grade Levels:
5-12

Subject Areas:
Technology
Engineering

Synopsis:
Frank Whittle was always fascinated by machines and how things work. When a plane crashes in his backyard, he becomes obsessed with air travel. He enlists in the Royal Air Force as a young adult, and is one of the best and most daring pilots. His desire to push beyond the limits of existing aircraft inspires him to create a completely new propulsion system: the jet engine.

Learning Objectives: Students will:

- Understand what drove Frank Whittle to invent the jet engine.
- Understand the creativity and perseverance that was required by Whittle to create the jet engine.
- Explain the challenges Whittle had to overcome to invent the jet engine.

Vocabulary:
Jet engine, propeller, Royal Air Force, Frank Whittle, E.A. Griffiths, propulsion

Pre-Viewing Discussion:
How has the jet engine changed the world since the 1940s? What would be different if it had never been invented?

Post-Viewing Discussion:
Why was Frank Whittle a good pilot? Why was he a difficult pilot?

Why did planes have to fly higher to go faster? What were the challenges Whittle faced in trying to make planes fly at higher altitudes?

How did Whittle's new jet engine work? What were the problems associated with it?

Why did the British government finally decide to invest in the jet engine? How were they able to solve Whittle's problems?

Further Activities:
Imagine that the jet engine is not invented until later in the 20th century. Write a report on how World War II might have ended.

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STREAMING MEDIA

Teacher's Guide

The Computer

Inventions that Shook the World Series

Grade Levels:
5-12

Subject Areas:
Technology
Engineering

Synopsis:
Conrad Zuse is a German engineer in the 1930s, struggling with the tools available to him as he calculates the effect of wind on airplane wings. This desire to have better tools at his disposal leads to the creation of the first programmable computer. The world is occupied by World War II, however, and his accomplishment goes un-heralded.

Learning Objectives: Students will:

- Understand what drove Conrad Zuse to create a computer.
- Understand how Zuse's computer worked and how that translates to today's electronics.
- Explain the challenges Zuse had to overcome to invent the computer.

Vocabulary:
Conrad Zuse, binary code, computer

Pre-Viewing Discussion:
How was the business world different before the invention of the computer? Give specific examples.

List some of the ways you have used computers so far today.

Post-Viewing Discussion:
Why was Zuse frustrated in his career? What aspects of his personality do you think account for this? Why did he decide to create a machine that would do mathematical calculations?

What was one of the benefits to moving away from mechanical switches to electrical relays? Why was this better?

How do you think the time period affected Zuse's work (specifically related to the fighting of World War II)?

Further Activities:
Imagine that the computer is never invented. Write a fictional story about a character that lives in this alternate 21st century.

Research the way the technology underlying computers has changed since Zuse's time. What has stayed consistent, and what has changed dramatically?

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Teacher's Guide

The Microwave Oven

Inventions that Shook the World Series

Grade Levels:
5-12

Subject Areas:
Technology
Engineering

Synopsis:
Percy Spencer only had a 6th grade education, but his invention of the microwave eventually earned him an honorary degree from the University of Massachusetts. His discovery stemmed out of an accident, when a chocolate bar melts in his pocket when he stands in front of a magnetron. By agitating the water molecules in food, the microwave oven can cook food up to 8 times faster than a conventional oven.

Learning Objectives: Students will:

- Understand how Spencer stumbled upon the idea of the microwave.
- Explain how the microwave works.

Vocabulary:
Microwave, Percy Spencer, magnetron, magnetic field, electromagnetic energy

Pre-Viewing Discussion:
Prior to the invention of the microwave, do you think people ever imagined cooking food without heat? Why or why not?

What are some of the effects of the microwave on the cooking habits of people since the 1940s? What makes the microwave so popular?

Post-Viewing Discussion:
What was Percy Spencer's background? How do you think that affected his personality and his ability to create new things?

How did Spencer discover the potential for cooking food without heat? How did he test his hypothesis?

How do you think Spencer felt when he received his honorary degree from the University of Massachusetts?

Further Activities:
Research other cooking technologies and how they were invented. Write a biography of one of the inventors you discover.

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Teacher's Guide

Kitty Litter

Inventions that Shook the World Series

Grade Levels:
5-12

Subject Areas:
Science
Engineering

Synopsis:
Ed Lowe fought in the Navy during World War II. When the War was over, Ed went back to Michigan and worked in his father's sand and sawdust business. On a cold night, his neighbor asked if he had something she could use in her cat box. He gave her some Fuller's Earth, a superabsorbent clay material. It worked so well she was back the next day, and Ed took his product on the road selling to cat shows and pet stores. Today, Kitty Litter is a $1 billion a year industry.

Learning Objectives: Students will:

- Understand what drove Ed Lowe to continually look for new products for his father's business.
- Explain how Lowe stumbled upon Kitty Litter.
- Understand how a product like Kitty Litter developed into a huge industry.

Vocabulary:
Kitty litter, Fuller's Earth, superabsorbent

Pre-Viewing Discussion:
What do you think pet owners did with their cats before kitty litter? How would owning a cat be different without this product?

Post-Viewing Discussion:
How did Fuller's Earth come to be tested as a kitty litter? What were the results?

How was Fuller's Earth formed? What makes it super-absorbent?

How did Lowe initially sell his product? What eventually happened to his business?

Further Activities:
Research how Lowe created a business out of kitty litter. What steps did he take and how did the business grow?

Research and write a biography of Ed Lowe. Be sure to cover his childhood, personality, and other accomplishments.

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Teacher's Guide

The Crash Test Dummy

Inventions that Shook the World Series

Grade Levels:
5-12

Subject Areas:
Science
Technology
Engineering

Synopsis:
With the development of the jet engine in the 1940s, the U.S. Air Force looked for ways to make flying safer and help pilots survive crashes. Captain John Stapp, a doctor in the Air Force, heads up a project codenamed MX-981, focusing on crash safety. Eventually, the Air Force requires Captain Stapp to discontinue testing on himself, and he creates a crash test dummy with sensors to determine what is causing pilots to die during crashes. Once he figures it out for the Air Force, Stapp will make it his mission to make cars safer as well.

Learning Objectives: Students will:

- Understand the reasons for safety testing by the Air Force.
- Understand why the Air Force chose Captain Stapp to lead project MX-981.
- Explain the challenges Captain Stapp had to overcome during project MX-981 that led to the creation of the crash test dummy.

Vocabulary:
John Stapp, G-force, crash test dummy, accelerometer, pressure transducer

Pre-Viewing Discussion:
How do you think cars and air travel would be different today if we did not have the crash test dummy?

What do you think drove the invention of the crash test dummy? What do you think some of the challenges were?

Post-Viewing Discussion:
Why was Dr. Stapp chosen to head up project MX981?

What is the problem with the dummy made of sand? Why is it not sufficient for Dr. Stapp's tests? What were some of the injuries Dr. Stapp sustained during his testing?

Why did the crash test dummy need to be built like a real person? Why did they build the dummy with sensors inside?

Do you think Captain Stapp was too dedicated to his cause? Why or why not?

Further Activities:
Research the way crash test dummies have changed since Captain Stapp's invention. What has stayed consistent, and what has changed dramatically?