

Imaging Partnership

GEMS PRACTITIONER RESOURCES

What's An Engineer?

LESSON ONE

What you will learn:

- What is engineering and how it affects our lives.
- What an engineer does.
- How women have influenced engineering throughout history.
- The case study of Emily Cummins.
- Photographing products of engineering.

What you should be able to do:

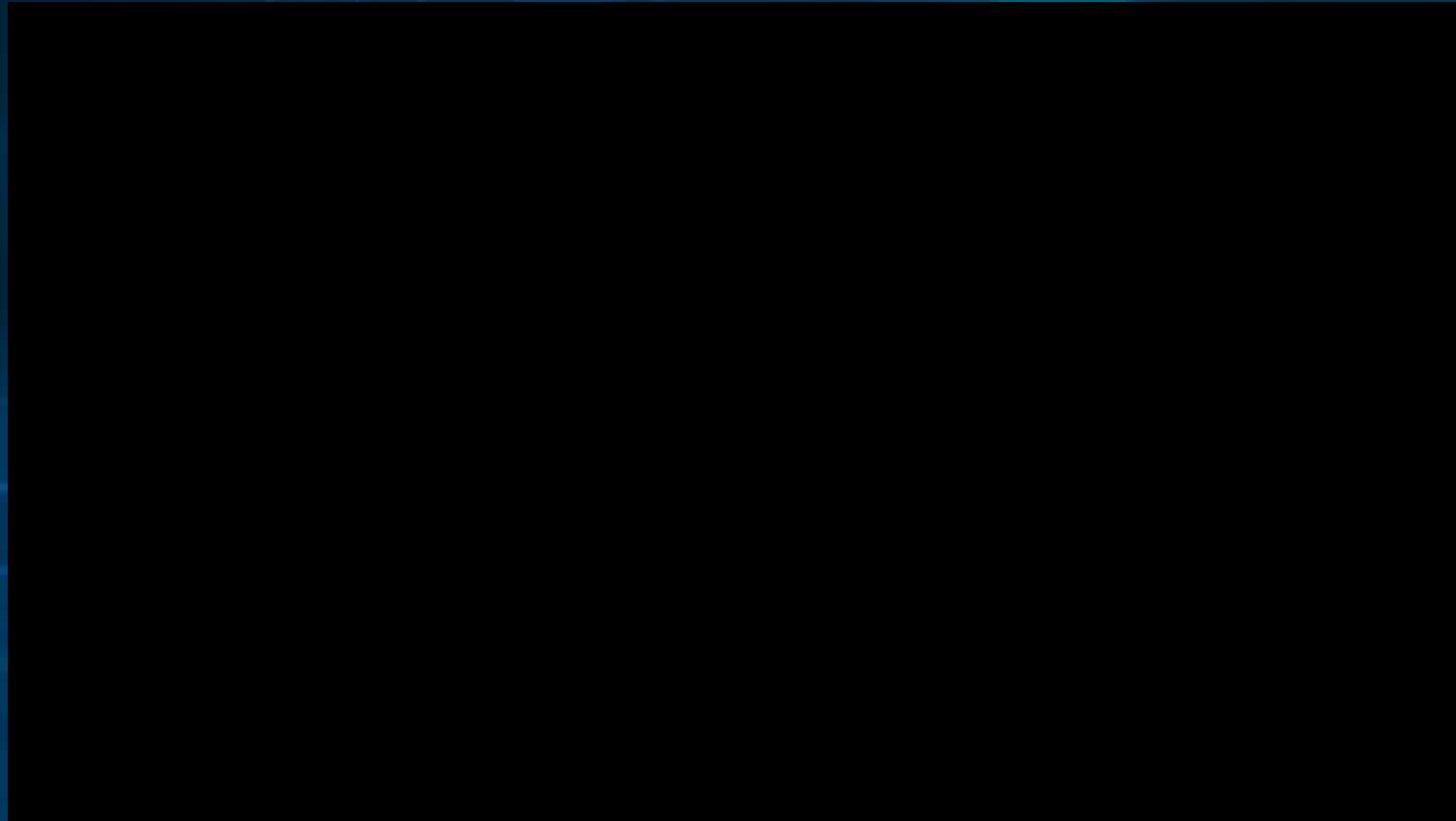
- Demonstrate your understanding of how engineering affects the world around us.
- Demonstrate your understanding of the role of an engineer.
- Demonstrate your understanding how women have influenced engineering throughout history.
- Take photographs using correct techniques as required.

What is Engineering?



- Engineering combines the fields of science and maths to solve real world problems that improve the world around us.
- Consider some things you use in your everyday life: Buildings, roads and bridges, vehicles (cars, planes and boats), computers and other electronic devices.
- Not a single one of them would exist without engineers! You wouldn't have been able to drive to work, check your Facebook status or even use the toilet this morning!.

What is Engineering?



What Does A Typical Engineer Do?



Trust me

I'm an engineer

- Engineers are problem solvers, organisers, communicators, calculators and designers.
- They are capable of clearly defining a problem and its relevant constraints (such as time, cost, etc.) and providing a simple solution.
- What really distinguishes an engineer is his or her ability to implement ideas in a cost effective and practical approach.
- This ability to take a thought, or abstract idea, and translate it into reality is what separates an engineer from other fields of science and mathematics.

History of Women in Engineering



Emily Warren Roebling

Emily Roebling stepped in as the first woman field engineer and technical leader of the Brooklyn Bridge when her husband, Washington Roebling, became paralyzed and could no longer work without the help of his wife. Emily became responsible for much of the chief engineer's duties, including day-to-day supervision and project management. The Brooklyn Bridge was completed in 1883 and holds a plaque honouring Emily and her husband.

History of Women in Engineering

Grace Murray Hopper



Rear Admiral Dr. Grace Murray Hopper was a remarkable woman who grandly rose to the challenges of programming the first computers. Admiral Hopper believed that the major obstacle to computers in non-scientific and business applications was the dearth of programmers for these far from user-friendly new machines. The key to opening up new worlds to computing, she knew, was the development and refinement of programming languages - languages that could be understood and used by people who were neither mathematicians nor computer experts. It took several years for her to demonstrate that this idea was feasible.

History of Women in Engineering



Olive Dennis

Olive Dennis was the first female member of the American Railway Engineering Association. In November of 1921, Olive was designated as the engineer of service. This was mainly due to an effort to keep the support of female passengers as cars and intercity buses became more common. Her responsibility was to improve passenger service on the B & O. For the next 30 years, Olive contributed to passenger comfort in various ways. She invented and held the patent for the Dennis ventilator, which was in the windows of passenger cars and could be controlled by passengers. She also played a major role in air-conditioning the coaches, dimming overhead lights, reclining individual seats, and creating stain-resistant upholstery.

History of Women in Engineering



Helen Augusta Blanchard

Helen Augusta Blanchard was one of the greatest inventors of the industrial era. She was often referred to as "Lady Edison". She held 28 patents, 22 of which had something to do with sewing machines. She was born in 1840 to a wealthy family from Maine. When her family lost their fortune her mechanical skills came in handy. She filed her first patent for her most famous zigzag sewing machine in 1873. This zigzag stitch sealed the raw edges of the seam, which made the garment sturdier. Her 1873 zigzagger is now on display at the Museum of American History in Washington, D.C. Other remarkable inventions by Blanchard are self-taking needles and a surgical needle.

History of Women in Engineering



Mary Anderson

Mary Anderson invented the windshield wiper after a winter trip to New York in 1903 where she observed a driver leaving his front window open to clear falling sleet from the windshield. In November 1903 Anderson was granted her first patent for the invention of the windshield wiper. After the patent to her wiper expired in 1920 and with the growth of the automobile market, auto manufacturers adopted Anderson's basic design of the wiper into their standard equipment.

History of Women in Engineering

- WES (Women's Engineering Society) was founded on 23 June 1919 by a small committee drawn from the National Council of Women, which was created during the 1914-18 war to get women into work to release men for the armed forces. This group of influential women had government backing to support women engineers who, although welcomed into the profession during World War 1, were under pressure at the end of the war to leave the workforce to release jobs for men returning from the forces. These women founded WES, not only to resist this pressure, but also to promote engineering as a rewarding job for women as well as men.
- As engineering evolves, there are many more opportunities for women to step forward as leaders in their field and become recognized.

History of Women in Engineering – Emily Cummins



- Emily Cummins is one of the UK's brightest young inventors. During her time at the University of Leeds, Emily received numerous awards in recognition of her talent including being named as one of the Top Ten Outstanding Young People in the World in 2010 and winning a Barclays Woman of the Year Award in 2009. Whilst studying at the University's Business School, Emily was able to develop a sustainable fridge that runs without electricity using heat transfer and evaporation of dirty water, an invention that is now used across South Africa, Zambia, Zimbabwe and Botswana making a real difference to people's lives.

Emily Cummins: Her Inventions



My sustainable fridge is 'powered' by dirty water

Sustainable refrigerator

- We can't continue to rely on electrical appliances powered by fossil fuels, so I tried to come up with an alternative: a sustainable fridge which is 'powered' by dirty water. My prototype consists of two metallic cylinders, one inside the other, between which a locally-sourced material such as sand or wool is packed tightly before being soaked with water. When the fridge is placed in a warm environment, the sun's energy causes the outer part of the fridge to 'sweat.' Water evaporates from the sand or wool and heat energy is transferred away from the inner cylinder, which therefore becomes cooler. The design is ideal for use in the developing world because it doesn't require electricity and can be built using barrels, spare car parts and ordinary household materials. Unlike previous pot-in-pot coolers, the contents are kept dry and hygienic because the water does not come into contact with the product.

Emily Cummins: Her Inventions



My water carrier makes the long journey more productive

Water carrier

- African women and children often walk many miles a day to collect water using only one or two jerry cans, so I designed a carrier that would make their journey easier and more productive. Up to five containers of water can be held in place using surplus tyre inner tubes. Inspired by the Dyson Ball Barrow, the 'wheel' provides maximum stability for the containers and is created using tree branch sections of varying diameter. Pegs are used instead of glue so that individual components can be renewed as needed. The product can be adapted to carry firewood or other heavy loads and may be completely recycled at the end of its working life.

History of Women in Engineering – Emily Cummins



My tooth paste dispenser helped Grandad squeeze the tube

Toothpaste dispenser

- One of my Grandads couldn't squeeze toothpaste tubes properly because of his arthritis, so I created a dispenser that changed the squeezing action into a pushing one. The angled back-plate is attached, via a pivot, to a lever that can be pushed by any part of the body. As the lever is depressed it squeezes the tube from the top down, minimising wastage. The dispenser can be used with a variety of products, by people with limited arm movement or prosthetic limbs and in situations where hygiene is important, such as in hospitals or kitchens.

Photographing Products of Engineering



- University of Cambridge Department of Engineering photo competition help to bring engineering brightly and vividly to life. The competition has been running since 2008 with the aim of finding images that can be used to illustrate what engineering is about.
- The competition aims to show that engineering is not only about fixing machines and building bridges, but involves everything from studying objects and processes in microscopic detail, to building towering structures.
- The winning images tell wonderful stories of engineering students, researchers and academics seeking to discover new scientific truths and advance.

The photograph 'London Gateway by Night' was taken by Andrew Bowen, the Engineering Director of the project.

Photographing Products of Engineering

Do you think you could enter this competition?

The winning photograph could be of a: microscopic feature, laboratory, project team, computer simulation, production line, robot, lecture theatre, engineers out in the field etc.



So what have we learned?

- How engineering affects our lives.
- What an engineer does.
- How women have influenced engineering throughout history.
- The story of Emily Cummins and her inventions.
- Photographing products of engineering.