

# Western Engineering Outreach

Canadian Inventors

Grade 6-8

Meet Today's ENG HERO!



Jason Gerhard – Professor

*Dr. Gerhard has nearly 20 years of experience leading research into the fate and remediation of organic contaminant in soils and groundwater. As a Professor at Western, he leads the internationally recognized RESTORE (Research for Subsurface Transport and Remediation Group). Dr. Gerhard is co-inventor of the STAR thermal remediation technology and leads its ongoing emergence as a widely applicable in situ and ex situ treatment as well as a waste-to-energy strategy. To learn more about Dr. Gerhard visit: [https://www.eng.uwo.ca/civil/faculty/gerhard\\_j/index.html](https://www.eng.uwo.ca/civil/faculty/gerhard_j/index.html)*

## Learning Goal:

- Students will learn about some of the greatest Canadian inventions and then find a problem in their own community to make an invention which solves that problem.
- Curriculum connections: Grade 7- Form and function

## Materials Needed:

- Cardboard
- Cups
- Straws
- Popsicle sticks
- Tape
- Paper
- Markers
- Construction paper and white paper
- String
- Scissors
- Aluminum foil
- Other design and build materials



## *Engineering and Science Connections:*

Canada is a diverse land, with many unique people who have had some amazing ideas and inventions. Here is a short list of some important inventions made in Canada:

Synthetic insulin, Walkie-Talkie, Wheelchair accessible bus, Canadarm, Snowmobile, Electric wheelchair, Snow blower, Foghorn, Garbage bag, Goalie Mask, Advancements in Pacemakers, Alkaline battery, Electric Oven, Egg carton, and Paint roller.

For a long time, Canadians have seen problems around them and invented something to help solve them. Be it seeing a conflict between a farmer and a hotel owner over broken eggs, then inventing the egg carton; or discovering a treatment for diabetes, insulin. Here's a bit more information about some of the Canadian inventions above.

### *Goalie mask*

Jacques Plante was the first goaltender to create and use a practical mask in 1959.

Plante's mask was a piece of fiberglass that was contoured to his face

He first wore it in an NHL game between the Montreal Canadiens and New York Rangers

Plante went on a long unbeaten streak wearing the mask, which stopped when he was asked to remove it for a game.

### *Insulin*

Insulin is a hormone produced in the pancreas to control blood sugar levels.

It was isolated in 1921-22 at the University of Toronto.

The scientists involved in the research were Dr. Frederick Banting, Charles Best

This helps people with diabetes manage the condition.

### *Snowblower*

The first prototype was completed in 1925 by Arthur Sicard in Sainte-Thérèse, Quebec

By 1927 his vehicles were in use removing snow from the roadways of the town of Outremont, now a borough of Montreal

### *Electric Wheelchair*

George Johann Klein, from Hamilton, is often called the most productive inventor in Canada in the 20th century.

During his time working for the National Research Council of Canada, he invented the electric wheelchair, helped design the first nuclear reactor outside of the US (called the ZEEP), worked as chief consultant on gears design inside the CANADARM and more!

## What is an engineer?

An engineer is someone who uses knowledge of math and science to design solutions to problems.

There are many kinds of engineers who specialize in certain categories of problems.

Let's look at some of the main branches of engineering

### *Civil engineers*

The oldest kind of modern engineering, civil engineers design all of the things we need to stay still, everything from roads and bridges to buildings and water distribution networks.

### *Chemical engineers*

Design processes and build equipment used in chemical manufacturing and synthesis. Chemical engineers often focus on designing ways to use chemicals that are better for the environment or safer for humans to use.

### *Computer engineers*

Usually specialize further into designing either software (programs that tell computers what to do) or hardware (circuit boards, actual computers and computer devices) engineers.

### *Electrical engineers*

Work with electricity and electrical devices (building wiring, devices for power generation/transmission, etc.). Many electrical engineers are employed by utility companies across the continent to help maintain and design the electrical transmission systems that we rely on for our electricity.

### *Mechanical engineers*

Design any of the machines we make that are supposed to move and usually specialize in particular kinds of machines; be they planes, trains, automobiles, ships, or rockets, mechanical engineers help us move things around.

### **Integrated engineers**

This kind of engineering focuses on a systems approach to designs. So integrated engineers often either specialize in improving a process for making something or specialize in projects including lots of kinds of engineers.

## Activity:

Today you're going to be engineers to build an invention to solve a problem in your community. Afterwards, you'll be pitching your creation to city council (your parents or guardians).

The problem you try to solve could be anything, it could be as small as designing a better way to remember talking with your friends, to something as large and complicated as an automatic snack dispenser.

When engineers design things, they follow a process called the Engineering Design Process.

There are four steps in the engineering design process:

1. Plan
2. Build
3. Test
4. Iterate

### Step 1:

Brainstorm what your problem is, what is it that needs to be solved?

Using what you know of your problem and the materials you have available, design your first prototype.

### Step 2:

Build your prototype, don't worry if you need to change the design from what you first came up with. In engineering, it is very common for the initial design to change between the first draft of the plan and the first prototype.

### Step 3:

Test your prototype, did it work? What didn't work very well? What are some things you can change to make it better? What parts are already really good?

### Step 4:

Iterate, in this step we take everything we learned from the three previous steps and we start over now that we know more about what problems we have left to solve with our solution.

Once you have iterated enough times to satisfactorily solve your problem, then you can take your final prototype and pitch your creation to the 'city council' (aka parents or guardians).

## What Did You Learn?



- What setbacks or challenges did you overcome? How did you overcome them?
- What is your design? What problem in your community does this solve?
- Why did you choose this problem?

## Future Learning



- Continue this activity! Once you have a design that solves your problem, try to find ways you can improve it. Following the engineering design process, design your solution to be more sustainable long term, or make it easier to use, or use materials which are cheaper. When you are iterating your solution, don't forget that we often want to balance between multiple parts of the design. For example, very few people want an indestructible garbage bag that costs hundreds of dollars, but no one wants a very cheap garbage bag that always breaks (cost vs. durability).

## Share your creations!

We would love to see what you made. Email us at [discover@uwo.ca](mailto:discover@uwo.ca) or tag us on social media.

Instagram: @westernueng

Twitter: @westernueng

Facebook: @westernueng

*Thanks for discovering with us!*