

WOMEN IN STEM

CONCEPTS AND CONNECTIONS

Scientists today are tackling some of the biggest challenges that our world has ever seen. To address problems like food and water security, energy shortages, or disease control, it is important to be innovative. **Ann Makosinski** started designing inventions in high school, eventually creating the Hollow Flashlight that is powered by the heat of the human hand.

Did you know?

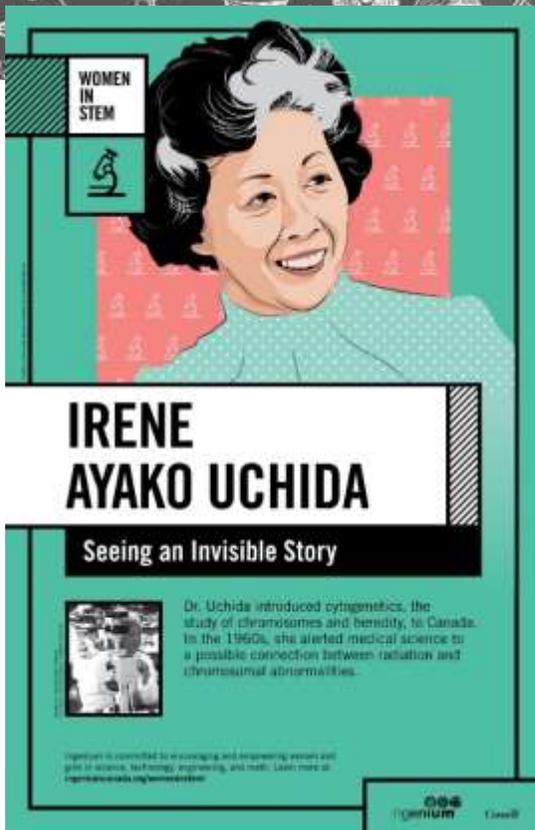
Love wifi? You can thank Hedy Lamarr, the inventor and actress who starred in films while laying the foundations for wireless communications.*

Grades 4-6	Grades 6-8	Grades 9+
<p>Innovation: Innovation involves being creative and useful while solving problems.</p> <p>What are some examples of innovation in science and technology?</p>	<p>Innovation: Innovation involves being creative and useful while solving problems.</p> <p>What are some examples of innovation in science and technology?</p> <p>What innovations or inventions were created by women? What about Canadian women?</p>	<p>Innovation: Innovation involves being creative and useful while solving problems.</p> <p>What are some examples of innovation in science and technology?</p> <p>What innovations or inventions were created by women? What about Canadian women?</p> <p>How might scientific innovation be impacted by a lack of women in STEM? How might greater diversity benefit scientific innovation?</p>

*References:

Durack, K. T. (1997). Gender, technology, and the history of technical communication. *Technical Communication Quarterly*, 6(3), 249-260.

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CONCEPTS AND CONNECTIONS

Dr. Irene Ayako Uchida was a Canadian who studied human genes. As a Japanese-Canadian, Uchida and her family were sent to an internment camp in the Second World War. After the war, she continued her work and was the first person to introduce cytogenetics (i.e., the study of chromosomes in cells) to Canada.

Did you know?

Thousands of Japanese-Canadians were interned in camps during Second World War because of the conflict between Canada and its allies and Japan. In 1988, Prime Minister Brian Mulroney apologized to Japanese-Canadians for these actions.

Grades 4-6	Grades 6-8	Grades 9+
<p>Racism: Racism refers to negative attitudes toward people because based on race or ethnicity.</p> <p>How could racism or racial discrimination impact women in STEM?</p>	<p>Racism: Racism refers to negative attitudes toward people because based on race or ethnicity.</p> <p>How could racism or racial discrimination impact women in science?</p> <p>What strategies can be used to combat racism and sexism in STEM?</p>	<p>Racism: Racism refers to negative attitudes toward people because based on race or ethnicity.</p> <p>How could racism or racial discrimination impact women in science?</p> <p>How can individuals and organizations combat racism and sexism in STEM and in society more broadly?</p>

WOMEN IN STEM



MELISSA SARIFFODEEN

Critical Coding Skills

Sariffodeen is co-founder and CEO of Canada Learning Code. Her organization teaches digital literacy to women and girls, so they can rock the fast-paced world of technology.

Ingenium is committed to recognizing and empowering women and girls in science, technology, engineering, and math. Learn more at ingeniumcanada.org/womeninstem

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CONCEPTS AND CONNECTIONS

Many people do not know how important women were in creating and advancing computer science. Ada Lovelace wrote the first computer algorithms and the first “computers” were often groups of women. The film ‘Hidden Figures’ showed how African-American women played a critical role in getting Americans into space for the first time.

Did you know?

American computer scientist Margaret Hamilton is credited with creating the term ‘software engineering’.[†]

Grades 4-6	Grades 6-8	Grades 9+
<p>Equity: Equity means giving people what they need, versus equality, whereby all people are treated the same thing regardless of different needs.</p> <p>How is the shortage of women in computer science linked to a lack of equity?</p>	<p>Equity: Equity means giving people what they need, versus equality, whereby all people are treated the same thing regardless of different needs.</p> <p>How is the shortage of women in computer science linked to a lack of equity?</p>	<p>Equity: Equity means giving people what they need, versus equality, whereby all people are treated the same thing regardless of different needs.</p> <p>How is the shortage of women in computer science linked to a lack of equity?</p> <p>What factors can explain the persistent inequitable status of women in computer science and technology?</p>

[†] **References:**

Hango, D. W. (2013). Gender differences in science, technology, engineering, mathematics and computer science (STEM) programs at university. Statistics Canada= Statistique Canada.

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RACHEL CHANG

Scientist in the Mist

Dr. Chang researches how types of particles in the atmosphere change fog properties. Her aerosol studies enrich our understanding of the forces that affect climate systems in the Arctic.

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CONCEPTS AND CONNECTIONS

Earth's oceans are vital to life – the ocean provides half of the oxygen that humans need to breathe. The oceans also provide different medicines and food sources for the world's population. **Dr. Rachel Chang's** work relates to the changing climate in the Arctic, which is warming faster than anywhere on Earth.‡

Did you know?

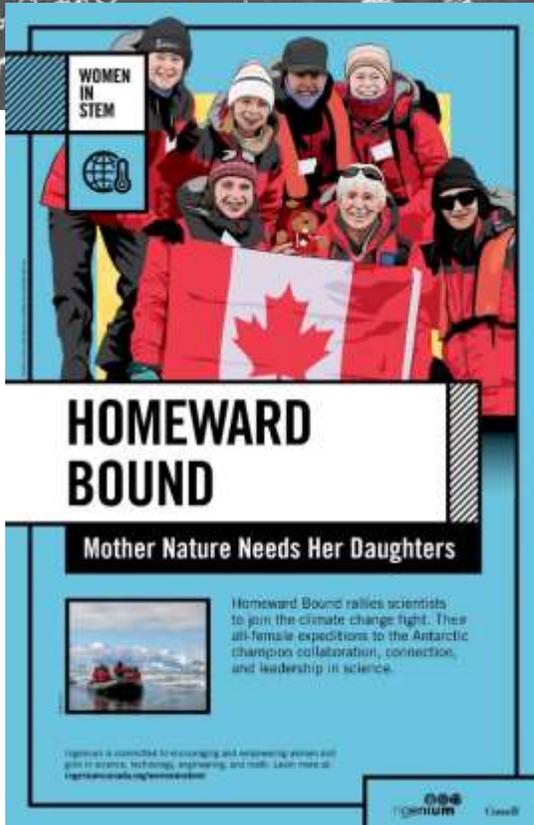
In 1952, sulphur particles mixed with fumes from burning coal to cause the Great Fog of London, which killed more than 12,000 people in 5 days.

Grades 4-6	Grades 6-8	Grades 9+
<p>Sustainability: Humans have damaged the environment, causing climate changes like extreme weather events. Sustainability means using less and limiting damage to the Earth and other species.</p> <p>How does climate change impact different groups of people?</p>	<p>Sustainability: Humans have damaged the environment, causing climate changes like extreme weather events. Sustainability means using less and limiting damage to the Earth and other species.</p> <p>How does climate change impact different groups of people?</p> <p>How can the participation of women in STEM advance climate science?</p>	<p>Sustainability: Humans have damaged the environment, causing climate changes like extreme weather events. Sustainability means using less and limiting damage to the Earth and other species.</p> <p>How does climate change impact different groups of people?</p> <p>How can the participation of women in STEM advance climate science?</p> <p>How can climate science benefit from diverse perspectives?</p>

‡ References:

<https://oceanservice.noaa.gov/facts/why-care-about-ocean.html>

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CONCEPTS AND CONNECTIONS

Working with others is a necessary skill for scientists, who often collaborate across disciplines, nations, or continents.

Homeward Bound is a one-of-a-kind leadership initiative, involving expeditions to Antarctica, which aim to increase the influence of women in making decisions that affect the future of our planet.[§]

Did you know?

Josée Auclair is the first Canadian woman to have led expeditions to the North and South Poles.

Grades 4-6	Grades 6-8	Grades 9+
<p>Collaboration: Today, students are focused on global skills like collaboration or working together to complete tasks.</p> <p>How does STEM benefit from collaboration?</p> <p>What does scientific collaboration look like in the classroom? In the lab? In the field?</p>	<p>Collaboration: Today, students are focusing on global skills like collaboration or working together to complete tasks.</p> <p>What are the benefits and challenges of scientific collaboration?</p> <p>How can students experience scientific collaboration in the classroom?</p>	<p>Collaboration: Today, students are focusing on global skills like collaboration or working together to complete tasks.</p> <p>What are the benefits and challenges of scientific collaboration?</p> <p>How can systems and institutions create environments in which scientific collaboration can occur?</p>

[§] **References:**

<https://homewardboundprojects.com.au/about/>

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CONCEPTS AND CONNECTIONS

Dr. Jill Tarter was often the only woman in her engineering and astronomy classes. Over time, she became one of several women to challenge the stereotype of what a scientist looks like. When asked to draw a scientist, most people draw an older Caucasian man with white hair in a lab coat. That stereotype is changing; Draw-A-Scientist studies from the past 50 years show that children's drawings of scientists depicted women more in recent decades (although not more than they depicted men).**

Did you know?

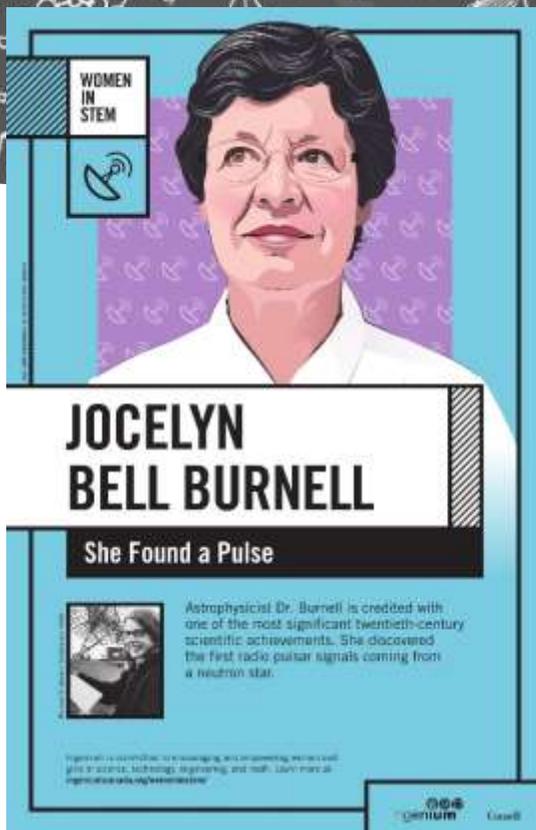
Dr. Jill Tarter was the real-life inspiration for Jodi Foster's character in the movie *Contact*.

Grades 4-6	Grades 6-8	Grades 9+
<p>Stereotypes: Stereotypes are overgeneralizations of groups of people that are often negative and imply that all people in a demographic category are alike.</p> <p>What examples of gender stereotypes can you think of?</p> <p>What is the stereotype of a scientist?</p>	<p>Stereotypes: Stereotypes are overgeneralizations of groups of people that are often negative and imply that all people in a demographic category are alike.</p> <p>How do the stereotypes of women and of scientists compare to one another?</p> <p>How do gender stereotypes impact women in the workplace?</p>	<p>Stereotypes: Stereotypes are overgeneralizations of groups of people that are often negative and imply that all people in a demographic category are alike.</p> <p>How do the stereotypes of women and of scientists compare to one another?</p> <p>In what ways could gender stereotypes negatively impact women in STEM across education and industry?</p>

** References:

Miller, D. I., Nolla, K. M., Eagly, A. H., & Uttal, D. H. (2018). The Development of Children's Gender-Science Stereotypes: A Meta-analysis of 5 Decades of US Draw-A-Scientist Studies. *Child development*.

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CONCEPTS AND CONNECTIONS

Dr. Jocelyn Bell Burnell remembers growing up in a time when boys studied science and girls studied home economics. Burnell broke traditional gender role expectations (i.e., staying home to raise family^{††}) by continuing her revolutionary physics research after getting married.

Did you know?

In 2008, Dr. Jocelyn Bell Burnell was appointed the first female President of the Institute of Physics.

Grades 4-6	Grades 6-8	Grades 9+
<p>Gender Roles: These are social roles including the behaviors and attitudes that are considered acceptable, appropriate, or desirable for people based on their actual or perceived sex or gender.</p> <p>What are some examples of traditional vs. non-traditional gender roles?</p> <p>How have gender roles changed since the 1950s?</p>	<p>Gender Roles: These are social roles encompassing the behaviors and attitudes that are considered acceptable, appropriate, or desirable for people based on their actual or perceived sex or gender.</p> <p>What are some examples of traditional vs. non-traditional gender roles?</p> <p>How might gender role expectations impact women studying or working in STEM?</p>	<p>Gender Roles: These are social roles encompassing the behaviors and attitudes that are considered acceptable, appropriate, or desirable for people based on their actual or perceived sex or gender.</p> <p>What are some examples of traditional vs. non-traditional gender roles?</p> <p>How might gender role expectations impact women studying or working in STEM?</p> <p>How do gender roles operate and become reinforced in scientific contexts?</p>

†† References:

Eagly, A. H., & Wood, W. (2011). *Social role theory*. Handbook of theories in social psychology, 2, 458-476.

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CONCEPTS AND CONNECTIONS

Gender identification reflects how a person wants to express gender, whereas sexual orientation refers to sexual or romantic interest. In science, there are few gender and sexual minorities. As a computer scientist and transwoman, **Dr. Lynn Conway** is an advocate for greater inclusion in science.^{##}

Did you know?

A concept called superposition in Quantum computing refers to a value not being binary (i.e., 1 or 0) but instead the value has a fluid value or identity, like gender.

Grades 4-6	Grades 6-8	Grades 9+
<p><i>Beyond the Binary:</i> Gender identity is the personal sense of one's own gender. Gender identity can be the same or different from sex. Each culture has a set of gender categories (often more than two) and people may identify with more than one gender or no specific gender.</p> <p>How is gender different than sex?</p>	<p><i>Beyond the Binary:</i> Gender identity is the personal sense of one's own gender. Gender identity can be the same or different from sex. Each culture has a set of gender categories (often more than two) and people may identify with more than one gender or no specific gender.</p> <p>How is gender different than sex?</p> <p>How might gender identification or sexual orientation impact participation in STEM?</p>	<p><i>Beyond the Binary:</i> Gender identity is the personal sense of one's own gender. Gender identity can be the same or different from sex. Each culture has a set of gender categories (often more than two) and people may identify with more than one gender or no specific gender.</p> <p>How is gender different than sex?</p> <p>How might gender identification or sexual orientation impact recruitment and retention of people in STEM?</p>

References:

Yoder, J. B., & Mattheis, A. (2016). Queer in STEM: Workplace experiences reported in a national survey of LGBTQIA individuals in science, technology, engineering, and mathematics careers. *Journal of Homosexuality*, 63(1), 1-27.

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CONCEPTS AND CONNECTIONS

Women in general are underrepresented in science, technology, engineering, and math (STEM). Several reasons explain why there are few women in STEM, including gender discrimination, which can range from mild or subtle slights to more obvious unfair treatment or abuse.

Did you know?

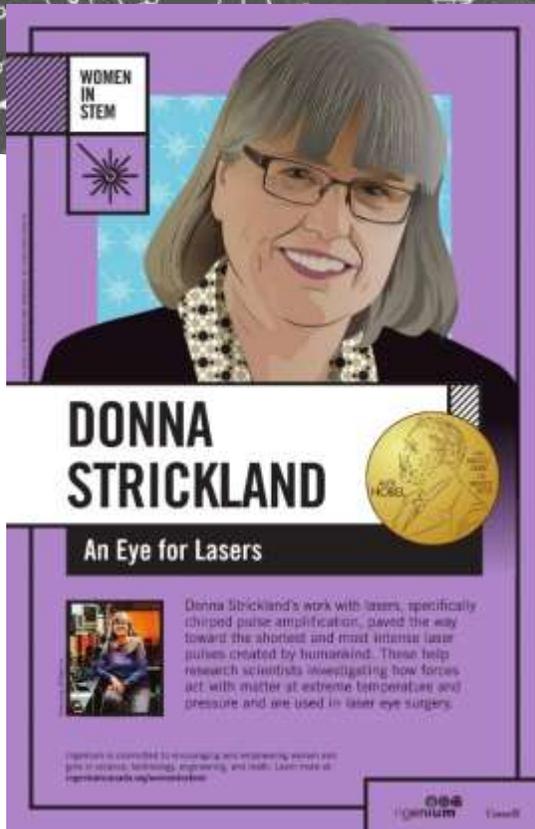
There is some evidence to suggest that women in STEM experience substantial gender discrimination, next only to women in the military.^{§§}

Grades 4-6	Grades 6-8	Grades 9+
<p>Gender Discrimination: Treating people unfairly or unjustly because of their gender or sex.</p> <p>How has gender discrimination affected women in STEM in the Canadian context?</p>	<p>Gender Discrimination: Treating people unfairly or unjustly because of their gender or sex.</p> <p>How has gender discrimination affected women in science in the Canadian context?</p> <p>What are some examples of gender discrimination in STEM? In what ways is the lack of women in STEM linked to discrimination?</p>	<p>Gender Discrimination: Treating people unfairly or unjustly because of their gender or sex.</p> <p>How has gender discrimination affected women in science in the Canadian context?</p> <p>What are some examples of gender discrimination in science? In what ways is the lack of women in STEM linked to discrimination?</p> <p>How will STEM be impacted by gender discrimination?</p>

§§ References:

National Academies of Sciences, Engineering, and Medicine. (2018). Sexual harassment of women: climate, culture, and consequences in academic sciences, engineering, and medicine. National Academies Press.

WOMEN IN STEM



CONCEPTS AND CONNECTIONS

The world celebrated in 2018 when **Dr. Donna Strickland** became the first woman to win a Nobel Prize in Physics in over 50 years. In fact, women comprise fewer than 4% of all Nobel Prize winners in the sciences (nobelprize.org).

Did you know?

The phenomenon of not recognizing women in science for their contributions is known as the Matilda Effect.^{***}

Grades 4-6	Grades 6-8	Grades 9+
<p>Recognition of Success: Often, women in STEM are not recognized for their accomplishments. This does not mean they are not participating in science.</p> <p>What is it like to go unrecognized for your work?</p>	<p>Recognition of Success: Often, women in STEM are not recognized for their accomplishments. This does not mean they are not participating in science.</p> <p>What social and other factors lead to women not being recognized for their accomplishments?</p>	<p>Recognition of Success: Often, women in STEM are not recognized for their accomplishments. This does not mean they are not participating in science.</p> <p>What social and other factors lead to women not being recognized for their accomplishments?</p> <p>In what ways can systems and policies be structured to ensure that women are better represented and recognized for their contributions in STEM?</p>

^{***} **References:**

Lincoln, A. E., Pincus, S., Koster, J. B., & Leboy, P. S. (2012). The Matilda Effect in science: Awards and prizes in the US, 1990s and 2000s. *Social studies of Science*, 42(2), 307-320.

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CONCEPTS AND CONNECTIONS

As the first woman to earn in PhD in electrical engineering at Queen's University, Dr. Veena Rawat has tackled challenges as a woman and as a person of colour. Intersectionality describes how different parts of our identity can combine to create unique experiences.

Did you know?

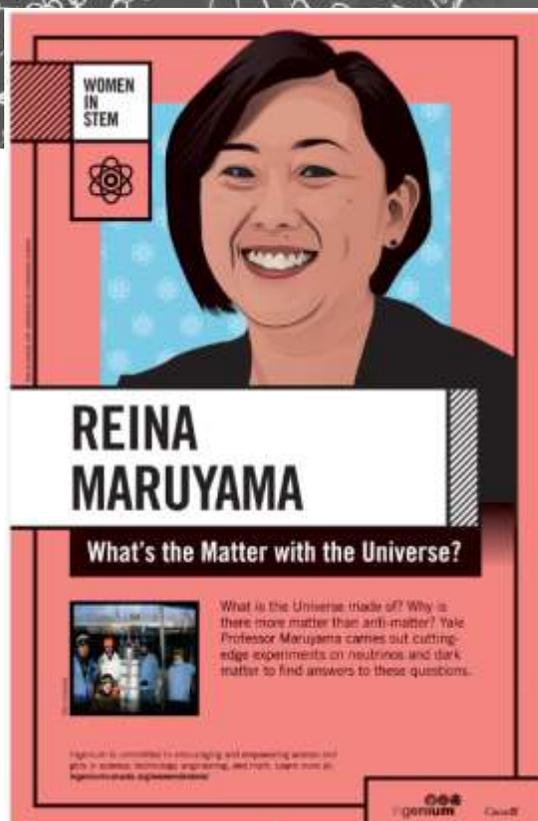
As of 2012, there were fewer than 75 female physics and astronomy faculty members who were either African-American or Hispanic in the entire U.S.^{†††}

Grades 4-6	Grades 6-8	Grades 9+
<p><i>Intersectionality.</i> How do race and gender or other demographic variables influence our experiences?</p>	<p><i>Intersectionality.</i> How do race and gender or other demographic variables influence our experiences?</p> <p>How does identifying with multiple different identities impact well-being? Discrimination?</p>	<p><i>Intersectionality.</i> How do race and gender or other demographic variables influence our experiences?</p> <p>How does identifying with multiple different identities impact well-being? Discrimination?</p> <p>What intersections do you personally occupy?</p> <p>What parts of identity could be marginalized? Which parts are associated with power and privilege?</p>

††† References:

Ivie, R., Anderson, G., & White, S. (2014). African Americans & Hispanics among Physics & Astronomy Faculty: Results from the 2012 Survey of Physics & Astronomy Degree-Granting Departments. Focus On. Statistical Research Center of the American Institute of Physics.

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CONCEPTS AND CONNECTIONS

By studying neutrinos and dark matter, **Reina Maruyama** hopes to discover how the early universe formed. Studying in science requires objectivity. People often make assumptions, without even recognizing it. For example, when we assume that someone possesses or lacks particular traits based on their appearance or even their name, we are letting bias overtake our objectivity.

Did you know?

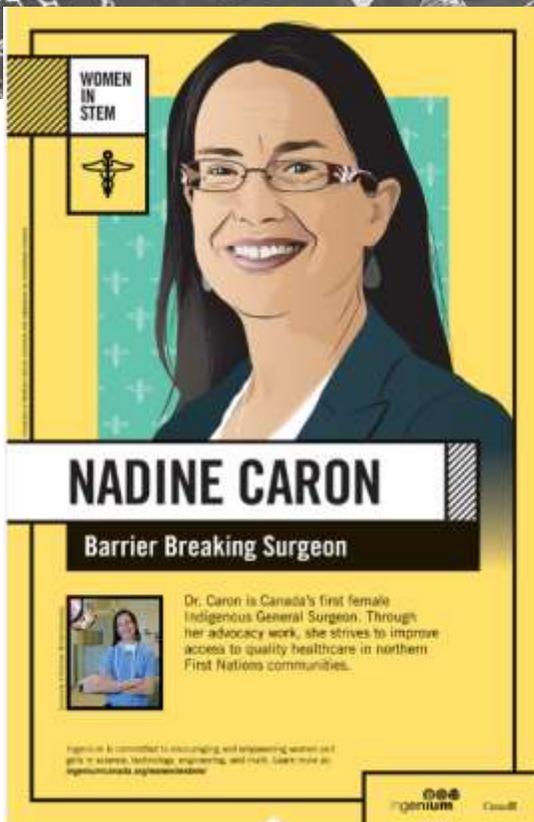
A study from 2011 in Toronto noted that resumes submitted with Asian-sounding names like “Samir Sharma” and “Lei Li” were 28% less likely to get a call for a job interview than people with British-sounding names like “Greg Johnson” or “Emily Brown”.^{##}

Grades 4-6	Grades 6-8	Grades 9+
<p><i>Implicit bias</i>: the automatic assumptions and conclusions that we make based on appearance.</p> <p>Think about popular movies and television shows – are men portrayed differently than women?</p> <p>Where could bias have an impact in what people think about others? Is it negative or positive?</p>	<p><i>Implicit bias</i>: the automatic assumptions and conclusions that we make based on appearance.</p> <p>Where could bias have an impact in what people think about others? Is it negative or positive?</p> <p>What are different forms of bias? Can you think of how bias could affect people who pursue STEM careers?</p>	<p><i>Implicit bias</i>: the automatic assumptions and conclusions that we make based on appearance.</p> <p>What are different forms of bias? Can you think of how bias could affect people in STEM careers?</p> <p>What sorts of biases do you think people have for women and their abilities in STEM?</p>

References:

Banerjee, Rupa, Reitz, Jeffrey & Oreopoulos, Phil (2017). Do Large Employers Treat Racial Minorities More Fairly? Ryerson University & University of Toronto

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CONCEPTS AND CONNECTIONS

Dr. Nadine Caron is the first Canadian general surgeon of First Nations descent. Her research focuses on the disparities between health services offered to people living in large urban communities and those living in Indigenous, rural, remote and northern communities.

Did you know?

Canada's Indigenous population suffers from significantly higher incidences of negative health indicators, such as obesity, diabetes, and lower life expectancy. This is partly due to food insecurity.^{\$\$\$}

Grades 4-6	Grades 6-8	Grades 9+
<p>What challenges do rural, remote, northern and Indigenous communities face that people in large, urban communities don't face?</p>	<p>What challenges do rural, remote, northern and Indigenous communities face that people in large urban communities don't face? Are there common elements for Aboriginal, rural, remote and northern communities?</p> <p>Could any of these pose a challenge to health care that someone in an urban setting might not face?</p>	<p>What challenges do rural, remote, northern and Indigenous communities face that people in large urban communities don't face? Are there common elements for Aboriginal, rural, remote and northern communities?</p> <p>Could any of these pose a challenge to health care that someone in an urban setting might not face?</p> <p>How might these differences be barriers to people who want to participate in STEM fields?</p>

\$\$\$ References:

Gionet, Linda and Roshanafshar, Shirin: Select health indicators of First Nations people living off reserve, Métis and Inuit. Statistics Canada, 2011.

WOMEN IN STEM

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CHARITY WANJIKU

Empowering with Power

Wanjiku's aim is to alleviate energy poverty in Africa. Her company Strauss Energy Ltd., designs and develops innovative solar panels that also act as building materials.

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CONCEPTS AND CONNECTIONS

Charity Wanjiku seeks to alleviate energy poverty in Africa. Her company, Strauss Energy, produces roof tiles that also serve as solar panels, providing reliable, green energy for homes. She also serves as a mentor for women wanting to enter the STEM fields.

Did you know?

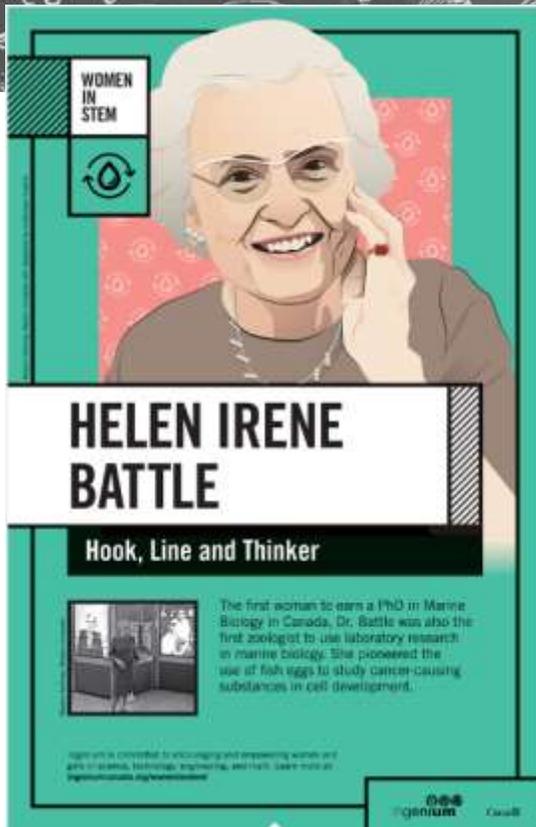
In developing countries, rural electrification benefits women and children the most: it increases safety, allows children to study after dark, and increases the amount of time a woman can use to generate extra income. ****

Grades 4-6	Grades 6-8	Grades 9+
<p>Charity Wanjiku's tiles serve both as roofing tiles and solar panels. Can you think of a how you could blend green technology into other building materials or structures?</p>	<p>Charity Wanjiku's tiles serve both as roofing tiles and solar panels. Can you think of a how you could blend green technology into other building materials or structures?</p> <p>What are some examples of developed countries? What countries are most underdeveloped? How are they different?</p>	<p>Charity Wanjiku's tiles serve both as roofing tiles and solar panels. Can you think of a how you could blend green technology into other building materials or structures?</p> <p>What are some examples of developed countries? What countries are most underdeveloped?</p> <p>In developing countries, what do you think contributes to the gender gap for girls and women in education generally, and STEM participation specifically?</p>

**** References:

Reiche, Killan; Covarrubias, Alvaro; Martinot, Eric: Expanding Electricity Access to Remote Areas: Off-Grid Rural Electrification in Developing Countries.

WOMEN IN STEM



CONCEPTS AND CONNECTIONS

Helen Irene Battle was the first woman to earn a PhD in Marine Biology in Canada, the first zoologist to use laboratory research in marine biology, and pioneered the use of fish eggs to study cancer. That's a lot of firsts!

Did you know?

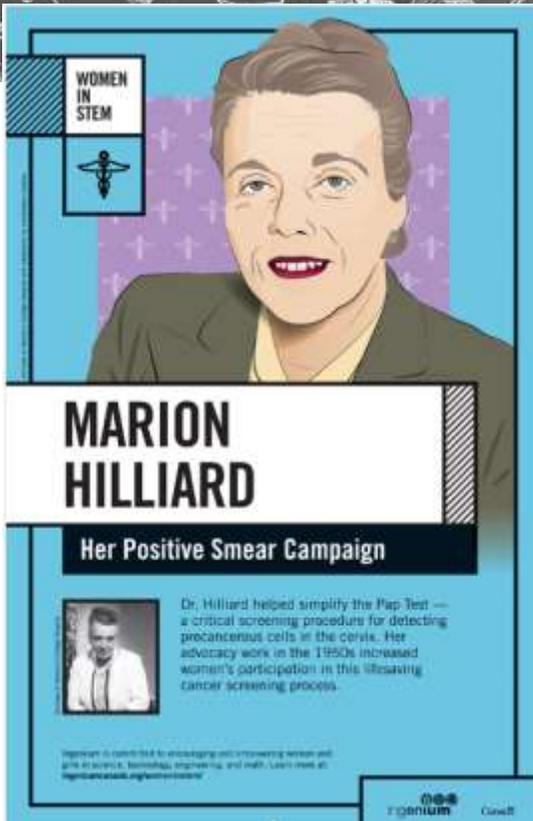
Rachel Carson's 1962 book *Silent Spring* not only catalyzed the global environmental movement at the time, it made excessive pesticide use a major public issue.††††

Grades 4-6	Grades 6-8	Grades 9+
<p>Trailblazers are important because they open the doors for others to follow. Do you know of any trailblazers? Did they face challenges? What sort of challenges would you think someone who achieves a "first" must face?</p>	<p>What challenges are faced by trailblazers?</p> <p>Although women have made strides in STEM, barriers still exist that women haven't crossed. Can you think of any?</p>	<p>What challenges are faced by trailblazers?</p> <p>Although women have made strides in STEM, barriers still exist that women haven't crossed. Can you think of any?</p> <p>Who are women trailblazers in STEM that you find inspiring? What barriers, if any, have they had to overcome? Can you relate to these challenges?</p>

†††† **References:**

Michals, Debra. "Rachel Carson" National Women's History Museum, accessed 2015

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CONCEPTS AND CONNECTIONS

Marion Hilliard's work in simplifying the Pap test has improved the early detection of cervical cancer. A patriarchal system marginalizes women and allows men to have a disproportionate influence in or on society. For instance, the concept of a “standard man” as the subject for medical tests and safety gear was predominant, leading to research that produced results that were often inaccurate, uncomfortable or impractical when applied to women.

Did you know?

A 1986 study on the effects of obesity on breast and uterine cancers was conducted at Rockefeller University. The study was called into question when people learned that none of the participants had a uterus – as they were all male.####

Grades 4-6	Grades 6-8	Grades 9+
<p>From designing furniture and electronics to safety and medical tests, industry tends to design things that ideally suit an average-sized man. Can you think of examples where this could negatively impact others, such as women or children?</p>	<p>From designing furniture and electronics to safety and medical tests, industry tends to design things that ideally suit an average-sized man. Can you think of examples where this could negatively impact others, such as women or children?</p> <p>How would more participation from women in engineering help?</p>	<p>How could not considering the differences between men and women negatively impact others, such as women or children, in the design of everyday objects?</p> <p>How would more participation from women in engineering help?</p> <p>What repercussions could arise from performing safety tests, such as crash tests, that only involve test subjects that correspond to an adult man? What about medical studies that only deal with men as subjects?</p>

References:

Flynn, Trisha. “Female Trouble” Rocky Mountain News. Republished in Chicago Tribune, October 29, 1986.

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EUGENIA DUODU

Inspired, Elevated and Empowered

Dr. Eugenia Duodu earned a PhD in medicinal chemistry from the University of Toronto. Today, she is the CEO of Visions of Science and Network for Learning, which offers STEM programs for low-income and marginalized youth.

Ingenium is committed to encouraging and empowering women and girls in science, technology, engineering, and math. Learn more at: ingeniumcanada.org/womeninstem/

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CONCEPTS AND CONNECTIONS

Whether it's in remote communities or large cities, child poverty can affect participation in STEM. For instance, a child living in poverty might go to school hungry, hindering their learning. **Eugenia Duodu's** Visions of Science and Network for Learning attempts to address this by offering STEM experiences to low-income and marginalized groups.

Did you know?

Poverty has extended costs that impact everyone. For example, people living in poverty are more likely to choose high-calorie, less nutritious food because of cost, which can lead to chronic health issues, costing our health system more. \$\$\$\$

Grades 4-6	Grades 6-8	Grades 9+
<p>What barriers does poverty put on people? Do any of these barriers affect women more than men?</p> <p>What can people, schools and other organisations do to help people interested in STEM overcome poverty?</p>	<p>What barriers does poverty put on people? Do any of these barriers affect women more than men?</p> <p>Could barriers related to poverty affect participation in STEM fields? Could these barriers affect women more than men?</p>	<p>What barriers does poverty put on people? Do any of these barriers affect women more than men?</p> <p>Could barriers related to poverty affect participation in STEM fields? Could these barriers affect women more than men?</p> <p>Does poverty prevent access to STEM careers more than other careers?</p>

References:

Public Health Agency of Canada. "The Chief Public Health Officer's Report on the State of Public Health in Canada, 2014: Public Health in the Future," 2014. Samuel Perreault, "Criminal victimization in Canada, 2014," from Juristat. Canadian Centre for Justice Statistics, Statistics Canada, 2015.

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NATALIE PANEK

Brilliant Space Cadet

Mechanical and Aerospace Engineer Panek rocketed into the exciting world of space science and engineering. Her work on space robotics contributes to many space exploration programs, including a rover mission to Mars.

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CONCEPTS AND CONNECTIONS

Natalie Panek has been described as a vocal advocate for women in technology. Evidence shows that the best way to encourage women to get involved in STEM is through discussing the issues such as social barriers and inequality.

Did you know?

Studies suggest that by making subtle changes to classrooms, teachers can remove barriers and promote inclusivity. Examples of these changes include: creating an inclusive physical learning environment, challenging beliefs about fixed abilities, and promoting the positive impacts STEM can make on others' lives. *****

Grades 4-6	Grades 6-8	Grades 9+
<p>Women make up half of the population. Can you think of jobs where you see women being under-represented? Are there any where women are over-represented?</p>	<p>Women make up half of the population. Can you think of jobs where you see women being under-represented or over-represented?</p> <p>Explore the differences between tokenism and representation. Can you think of some examples?</p>	<p>Women make up half of the population. Can you think of jobs where you see women being under-represented or over-represented?</p> <p>Explore the differences between tokenism and representation. Can you think of some examples?</p> <p>What effect could a lack of representation have on a woman or girl wanting to pursue a career in STEM?</p>

***** References:

Master, Allison and Meltzoff, Andrew: Building bridges between psychological science and education: Cultural stereotypes, STEM and equity. Prospects – UNESCO, 46, 215-234.

WOMEN IN STEM

WOMEN IN STEM

HIND AL-ABADLEH

Cracking the Chemistry of Climate Change

Professor Al-Abadleh's air pollution expertise won her the Fulbright Canadian Research Chair in Climate Change. She explores fundamental questions about the chemistry of air pollution, especially ground-level ozone and inhalable microscopic particles.

Ingenium is committed to encouraging and empowering women and girls in science, technology, engineering, and math. Learn more at: ingeniumcanada.org/womeninstem/

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CONCEPTS AND CONNECTIONS

Despite having some of the highest marks coming out of high school, **Hind Al-Abadleh** had to fight to pursue her dreams of gaining admission to university. Diversity benefits women and marginalized communities. But more broadly, it benefits everyone: for instance, studies have shown that the output of work from mixed-gender research teams is higher quality than single-gender teams.

Did you know?

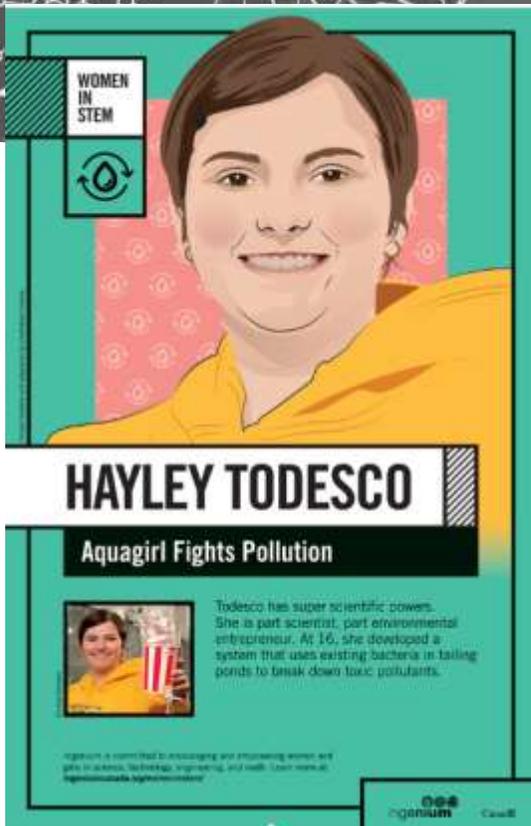
A recent study of businesses demonstrated a strong correlation between a diverse work force and higher profits. †††††

Grades 4-6	Grades 6-8	Grades 9+
<p>Diversity can mean different things to different people – it can include appearance, behaviour, experiences and beliefs.</p> <p>Do you think diversity is important? Why?</p> <p>What are different types of diversity?</p>	<p>Diversity can mean different things to different people – it can include appearance, behaviour, experiences and beliefs.</p> <p>Why do you think diversity is important? Why?</p> <p>What are different types of diversity?</p> <p>How could STEM fields benefit from more diversity?</p>	<p>Diversity can mean different things to different people – it can include appearance, behaviour, experiences and beliefs.</p> <p>Why do you think diversity is important? Why?</p> <p>What are different types of diversity?</p> <p>How could STEM fields benefit from more diversity?</p> <p>What can industry and academia do to increase diversity in STEM?</p>

††††† References:

Hunt, Vivian; Layton, Dennis; Prince, Sarah: Diversity Matters. November 2014, McKinsley & Company

WOMEN IN STEM



CONCEPTS AND CONNECTIONS

Hayley Todesco's fascination with science led her to an amazing discovery when she was only 16 years old. Although many girls may develop an interest in STEM, some lose interest by their mid-teens. This may be due to a lack of role models, gender norms and stereotypes, conformity to social expectations, and the patriarchal nature of STEM. Todesco's persistence in following a career in STEM is exceptional, and can serve to inspire girls and young women interested in the STEM fields.

Did you know?

A recent study showed that while 5-year-olds would associate high intelligence with their own gender, by age 6, both girls and boys associated high intelligence as being a male trait. #####

Grades 4-6	Grades 6-8	Grades 9+
<p>What are some examples of social expectations? Do some of these affect girls and women wanting to pursue a career in STEM?</p>	<p>What are some examples of social expectations? Do some of these affect girls and women wanting to pursue a career in STEM?</p> <p>How have some gender norms and stereotypes changed over time?</p>	<p>What are some examples of social expectations? Do some of these affect girls and women wanting to pursue a career in STEM?</p> <p>How have some gender norms and stereotypes changed over time?</p> <p>Are some social expectations more universal than others?</p>

References:

Bian, Lin; Leslie, Sarah-Jane and Cimpian, Andrei: Gender stereotypes about intellectual ability emerges early and influence children's interests. Science, January 27, 2017.