

# EDUCATION FOR INNOVATION

## Grades 1-8

A Resource Guide for Teachers



[CanadianInnovationSpace.ca](http://CanadianInnovationSpace.ca)



# Fondation Rideau Hall Foundation

Second Edition

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Published in Canada by the Rideau Hall Foundation  
9 Rideau Gate  
Ottawa, ON K1M 1M6

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This resource guide includes text adapted from *Ingenious* by the Right Honourable David Johnston and Tom Jenkins, published by Signal, a Division of Penguin Random House Canada, copyright © 2017, used with permission. It also includes text and illustrations adapted from *Innovation Nation* by the Right Honourable David Johnston and Tom Jenkins and illustrated by Josh Holinaty, published by Tundra Books, an imprint of Penguin Random House Canada Young Readers, copyright © 2017, used with permission.

This resource is available for download free of charge to teachers and other facilitators to lead learning activities to develop knowledge, skills and mindsets related to innovation.

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## Acknowledgements

The Rideau Hall Foundation wishes to express their appreciation for the expert advice of the many collaborators across Canada who made the Education for Innovation (E4I) resources possible.

Sharon Adie, Monika Albrecht, Emily Barber, Scott Barclay, Mary Bender, Emma Bishop, Joseph Bishop, Glenda Black, Courtney Brewer Iden, Greg Bulkiewski, David Cameron, Maria Cantalini-Williams, Christine Cho, Lisa Cole, Sandra Corbeil, Julie Corkett, Andrea Dafoe, Angela Davis, Marcia DeDominicis, Cathy DeGoey, Greg Dick, Maria DiMaria, Kathy Doherty-Masters, Kevin Donkers, Stephen Downes, Jenna Dunn, Joe Dwyer, Kate English, Margo Foster-Cohen, Rebecca Fralick, Andre Gallant, Karen Gallant, Barbara Gibbon, Scott Gibson, Lindsay Gray, Jenny Guibert, Chris Hachkowski, Scott Haldane, Kevin Higgins, Scott Hillier, Daniel Jarvis, Tom Jenkins, Rt. Hon. David Johnston, Leanne Kavanagh-Endicott, Dale Kern, Josée Latulippe, Michael Lynch, Lindsay P. Mann, Kathy Mantas, Soriana Mantini, Sabrina Marques, Fred Masters, Ryan McKay-Fleming, Sherry Masur-Smith, Jessica McKenzie, Olga Michalopoulos, Amy Mifflin-Sills, Sylvia Murdoch, Douglas Pepper, Maria Perham, Sarah Reinhart, Elizabete Ribeiro, Greg Rickwood, Bill Roche, Janet Ross, Daniel Scholtz, Judy Scholtz, Presley Sibbick, Tim Slack, Paul Smith, Tanya Solanki, Amber Stratton, Cathie Streeter, RJ Taylor, Shaun Thorson, Eden Wiersma, Marc Williams, Tonia Williams, Wade Young, Teacher candidates and faculty of Nipissing University, Schulich School of Education, Staff and Administration of schools in the following boards of education: Brant Haldimand Norfolk Catholic District School Board, Grand Erie District School Board, Waterloo Catholic District School, Waterloo Region District School Board, Ottawa Catholic District School Board and the staff of Giants and Gentlemen Advertising Agency.

# Innovation Learning Experiences

## Preamble

The Education for Innovation (E4I) resource is intended as an instructional framework mainly for use in elementary schools across Canada. This resource could also be used in homeschooling, camps, enrichment or recreational learning settings. The learning experiences outlined in this document are structured activities following the innovation process and the phases of the Innovation Cycle. The suggested learning experiences are intended to create awareness of Canadian innovations and to inspire learners to create their own innovations. The Innovation Cycle, explained in this resource, was developed to promote an understanding of the phases of innovation and is aligned with approaches such as design thinking, entrepreneurial programs and project-based learning.

Critical thinking, creativity, communication, collaboration, and entrepreneurship are considered 21st century global competencies. The E4I Resources, including the activities related to the Innovation Cycle and the culminating Innovation Project address, and integrate these 21st century learning competencies. The ability of future innovators to apply knowledge and empathy to real-world situations will be enhanced through immersion in E4I learning activities. Educators can encourage deep learning by providing youth with opportunities to transfer their knowledge and skills, lead their own learning and explore innovative solutions to address authentic societal issues.

Educators can plan the innovation experiences to address a range of curriculum and grade-level expectations as applicable. Each learning experience in the E4I resource offers potential goals, resources, teaching strategies and assessments which can be adjusted according to the professional perceptions of educators and the needs or interests of learners.

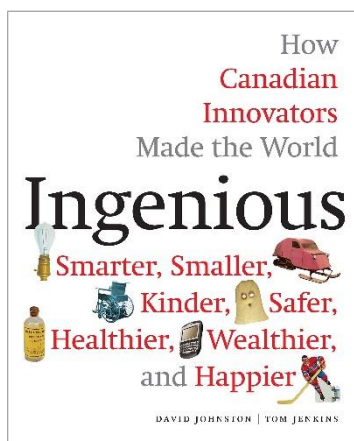
The Innovation Project is a culminating activity and could be presented at an Innovation Celebration which is designed to showcase innovations of Canadian youth. The Innovation Celebration could be held in a classroom, school, community, and can also involve an online component so that innovations are also shared with a virtual audience. Canadian Innovation Week, held annually in the month of May, provides yet another forum for Innovation Celebrations.

## Goals of the Resource

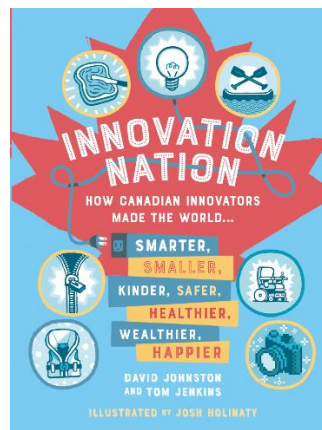
- Promote an understanding and appreciation of the concept of innovation.
- Provide learning experiences for guiding innovative thinking and actions.
- Utilize the stories of Canadian innovators to inspire future innovators.
- Celebrate Canadian innovations and cultivate a culture of innovation.

## Background

Canada has a rich history of innovation which is described in the books co-authored by the Right Honourable David Johnston and Tom Jenkins:



*Ingenious: How Canadian Innovators made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier, and Happier*



*Innovation Nation: How Canadian Innovators made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier, and Happier*

The Canadian innovations from the *Ingenious* and *Innovation Nation* books form the basis for the *Education for Innovation (E4I)* resource. They are referenced in the teaching materials and provide the content and context for the study of impactful Canadian innovations. The writing team of the Education for Innovation resources was invited to develop educational materials to accompany the books, *Ingenious* and *Innovation Nation*. Educators may wish to also use a range of other supporting materials as can be found in the references of this document.

The book *Ingenious* includes approximately 300 Canadian innovations that made an impact on the world. It also includes suggestions and strategies for promoting innovation and encouraging future innovators; the charts from *Ingenious* are directly related to the processes and phases described in the Innovation Cycle.

*Innovation Nation* is for emergent readers, with descriptions of 50 Canadian innovations pulled from the content of *Ingenious*. The intent of these books is to highlight significant innovations throughout Canada's history and to further develop a culture of innovation in Canadian society.

The stories of Canadian innovators and innovations are an excellent catalyst for inspiring youth. Our national website, Canadian Innovation Space, includes stories of past and current innovators, videos, and supporting materials: <https://canadianinnovationspace.ca>. The website also includes testimonials by educators who have used the Education for Innovation resources in their learning environments. Administrators and educators planning to implement the Education for Innovation resources may wish to review the testimonials and related videos.

## Definition of Innovation

Innovation is often described differently in various sources. Generally, it refers to creative thinking and problem-solving. For the purposes of the Education for Innovation (E4I) resource, innovation will be defined as follows:

*Innovation is the creation or improvement of a product or process to make an impact.*

## Innovation Learning Experiences

The Learning Experiences outlined in this resource include a series of intended to follow the phases of innovation: Inquiry, Ideation, Incubation, and Implementation. In each phase, learners will be asked to consider the Impact of innovations. Innovation is a cyclical, repetitive, and iterative process with constant revisiting and revising.

The suggested activities include resources and teaching strategies related to the complex process of innovation. The assessment strategies and tools have been designed to be used at the educator's discretion and adapted as necessary to meet the needs of diverse learners. It should be noted that learning experiences include two sets of templates in the Appendices: some that are appropriate for younger learners (grades 1-6) and others for older learners (grades 4-8).

In order to adapt the learning experiences to align with curriculum expectations in various subject areas, educators may select to focus on a set of Canadian innovations from *Innovation Nation* or *Ingenious* which are aligned to the topic being studied. For example, if an educator is addressing curriculum topics related to energy or environment, the Canadian innovations selected for the Inquiry experience could include the light bulb, blue box recycling, and weather strip. Another example of a unit of study might be related to transportation and could include examples such as the dump truck, the canoe, the air ambulance, the snowmobile, and the toboggan. The stories from *Innovation Nation* and *Ingenious* will serve as the inspiration for learning about the challenges and successes of Canadian innovators. Through the activities provided, educators can promote a greater understanding of innovation and encourage learners to develop their own ideas for culminating Innovation Projects. Learners will be motivated as they inquire, plan, create, test, improve, and implement innovations that they believe will make a positive impact on the world. The issue of positive impact or 'Innovation for Good' is addressed throughout the Innovation Cycle and is especially explored in the learning experiences related to developing and incubating an innovation.

The learning experiences in the Education for Innovation (E4I) resource were designed and modelled on the processes used by innovators and project teams across a range of sectors and disciplines.

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# Learning Experiences Overview

	Synopsis	Learning Strategies	Assessment Strategies & Tools	Appendices
1. What is Innovation?	Learners will demonstrate an understanding of the concept of innovation by developing a working definition.	Small Group Activity Word Sort  Graphic Organizer  Metacognitive Reflection	<b>Strategy:</b> Graphic Organizer Exit Ticket  <b>Tool:</b> Rating Scale	<ul style="list-style-type: none"> <li>• Canadian Innovations (<a href="#">Appendix 1A</a>)</li> <li>• Innovation vs. Invention Graphic Organizer (<a href="#">Appendix 1B</a>)</li> <li>• Exit Ticket (<a href="#">Appendix 1C</a>)</li> <li>• What is Innovation? Rating Scale (<a href="#">Appendix 1D</a>)</li> </ul>
2. What are the Impacts of Innovations?	Learners will explore the impact of Canadian innovations in preparation for determining the impact of their own innovation.	Small Group Discussion  Numbered Heads Collaborative Activity  Metacognition Reflection  Graphic Organizer	<b>Strategy:</b> Placemat Group Activity Impact of Innovations Activity Sheet Exit Ticket  <b>Tool:</b> Rating Scale	<ul style="list-style-type: none"> <li>• <i>Innovation Nation</i> Chapter Chart (<a href="#">Appendix 2A</a>)</li> <li>• <i>Ingenious</i> Chapter Chart (<a href="#">Appendix 2B</a>)</li> <li>• <i>Ingenious</i> Innovations Chart organized by Themes (<a href="#">Appendix 2C</a>)</li> <li>• Placemat Group Activity (<a href="#">Appendix 2D</a>)</li> <li>• Impact of Innovations (<a href="#">Appendix 2E</a>)</li> <li>• Exit Ticket (<a href="#">Appendix 2F</a>)</li> <li>• What is the Impact of Innovation? Assessment (<a href="#">Appendix 2G</a>)</li> </ul>
3. What is an Innovation Space?	Learners will develop and explore the Innovation Space. They will also inquire about past and present Canadian innovations.	Self-Guided Inquiry  Internet Technologies  Graphic Organizer	<b>Strategy:</b> Innovation Exploration Activity Sheet  <b>Tool:</b> Rating Scale	<ul style="list-style-type: none"> <li>• QR Code Activity Example (<a href="#">Appendix 3A</a>)</li> <li>• Innovation Exploration (<a href="#">Appendix 3B</a>)</li> <li>• Innovation Exploration (<a href="#">Appendix 3C</a>) (<a href="#">Appendix 3D</a>)</li> </ul>



	Synopsis	Learning Strategies	Assessment Strategies & Tools	Appendices
4. What are the Qualities of Innovators?	Learners will identify and recognize the qualities of innovators by examining examples of Canadian innovators.	Word Wall Learning Centres Metacognition Reflection Oral Presentation Graphic Organizer	<b>Strategy:</b> Expert Groups Innovator Exploration Activity Sheet  <b>Tool:</b> Self-Evaluation of Innovator Qualities Rating Scale	<ul style="list-style-type: none"> <li>• Innovator Exploration (<a href="#">Appendix 4A</a>) (<a href="#">Appendix 4B</a>)</li> <li>• Evaluating Your Own Innovator Qualities (<a href="#">Appendix 4C</a>) (<a href="#">Appendix 4D</a>)</li> <li>• Who is an Innovator? Rating Scale (<a href="#">Appendix 4E</a>)</li> </ul>
5. What is an Innovation Cycle?	Learners will examine the phases of the Innovation Cycle as well as the various aspects and questions within each phase.	Four Corners Activity Group Discussion Self-Correcting Activity	<b>Strategy:</b> Four Corners Activity Innovation Cycle Aspect Strips  <b>Tool:</b> Observation Chart	<ul style="list-style-type: none"> <li>• How can YOU be an Innovator? (<a href="#">Appendix 5A</a>)</li> <li>• Phases and Aspects of the Innovation Cycle (<a href="#">Appendix 5B</a>)</li> <li>• <i>Innovation Nation</i> Graphic of Innovation Cycle (<a href="#">Appendix 5C</a>)</li> <li>• Graphic of Innovation Cycle (<a href="#">Appendix 5D</a>)</li> <li>• Graphic of Innovation Cycle with aspects (Appendix 5E)</li> <li>• Innovation Cycle Aspects Strips (<a href="#">Appendix 5F</a>)</li> <li>• Observation Chart (<a href="#">Appendix 5G</a>)</li> </ul>
6. What is an Innovation Project?	Learners will become familiar with the expectations of their Innovation Projects and discuss project possibilities.	Group Discussion Brainstorming Graphic Organizer	<b>Strategy:</b> Innovation Brainstorming Activity Sheet Innovation Project Outline  <b>Tool:</b> Anecdotal Notes Innovation Project Rubric	<ul style="list-style-type: none"> <li>• Innovation Project Outline (<a href="#">Appendix 6A</a>) (<a href="#">Appendix 6B</a>)</li> <li>• Innovation Project Sheet (<a href="#">Appendix 6C</a>) (<a href="#">Appendix 6D</a>)</li> <li>• Innovation Brainstorming Assessment (<a href="#">Appendix 6E</a>)</li> </ul>

	Synopsis	Learning Strategies	Assessment Strategies & Tools	Appendices
7. How is an Innovation Idea Developed?	Learners will continue to develop their innovation idea using the innovation resources provided.	Small Group-Guided Learning  Conferencing  Graphic Organizer	<b>Strategy:</b> Innovation Package Activity Sheets  <b>Tool:</b> Group Reflection Rubric Educator Rubric	<ul style="list-style-type: none"> <li>• Innovation Package (<a href="#">Appendix 7A</a>) (<a href="#">Appendix 7B</a>)</li> <li>• Group Assessment (<a href="#">Appendix 7C</a>) (<a href="#">Appendix 7D</a>)</li> <li>• Educator Assessment (<a href="#">Appendix 7E</a>)</li> </ul>
8. How is an Innovation Tested and Improved?	Learners will develop a plan to test the effectiveness and impact of their innovation and create a plan to address any challenges.	Scientific Method  Interviews  Metacognition Reflection	<b>Strategy:</b> Testing Interview and Survey Activity Sheets Exit Ticket  <b>Tool:</b> Rating Scale <a href="#">Innovation for Good Declaration</a>	<ul style="list-style-type: none"> <li>• Sample of Innovation Testing - <i>Innovation: Child-proof Match Container</i> (<a href="#">Appendix 8A</a>)</li> <li>• Innovation Testing Template (<a href="#">Appendix 8B</a>) (<a href="#">Appendix 8C</a>)</li> <li>• Sample Interview Template (<a href="#">Appendix 8D</a>) (<a href="#">Appendix 8E</a>)</li> <li>• Sample Survey Template (<a href="#">Appendix 8F</a>) (<a href="#">Appendix 8G</a>)</li> <li>• Exit Ticket (<a href="#">Appendix 8H</a>)</li> <li>• Rating Scale/ Assessment (<a href="#">Appendix 8I</a>)</li> </ul>
9. How is an Innovation Implemented?	Learners will develop an Implementation Plan for the project including a budget, marketing, distribution, and communication.	Group Discussions  Planning  Roles for Group Members	<b>Strategy:</b> Implementation Plan Activity Sheets Innovation Presentation Activity Sheets  <b>Tool:</b> Innovation Presentation Checklist Innovation Project Rubric	<ul style="list-style-type: none"> <li>• Innovation Implementation Plan (<a href="#">Appendix 9A</a>)</li> <li>• Innovation Presentation Checklist (<a href="#">Appendix 9B</a>) (<a href="#">Appendix 9C</a>)</li> <li>• Innovation Implementation Plan Self Checklist (<a href="#">Appendix 9D</a>)</li> <li>• Innovation Implementation Plan Peer Checklist (<a href="#">Appendix 9E</a>)</li> </ul>
10. What is an Innovation Celebration?	Learners will plan, host and participate in an Innovation Celebration, sharing their innovations.	Oral Presentation  Media/Visual Presentation	<b>Strategy:</b> Innovation Celebration Presentation  <b>Tool:</b> Innovation Project Rubric	<ul style="list-style-type: none"> <li>• Task List (<a href="#">Appendix 10A</a>)</li> <li>• Sample Invitation (<a href="#">Appendix 10B</a>)</li> </ul>

# Learning Experience 1

## What is Innovation?

### Background

Innovation is a word that is often used in our society, yet it may not be well understood. Innovation may refer to ideas and improvements in areas such as science, business, and technology, but it also pertains to areas such as the arts, health care, sports, entertainment, education, food, social services, and governance.

Almost any object or idea that humans have created is the result of innovators asking simple questions, such as: What would happen if ...? How can we ...? What if we try ...? How can we make this better? There are many variations on the definition of innovation. For the purpose of the Education for Innovation resource, the following definition will be used:

**Innovation is the creation or improvement of a product or process to make an impact.**

For younger children, the following is a simplified definition:

**Innovating is creating or improving a thing or action to make a difference.**

Educators may post the definition of innovation for reference by learners. It is also important to clarify the difference between an invention and an innovation. Invention is the creation of a new product (thing) which may or may not have been implemented to make an impact. An innovation can refer to the creation of a new product (thing), but it is also the improvement of a product or process to make a positive impact. An invention is usually new, science-based and may not have necessarily been implemented to make an impact. An innovation is the creation or improvement of a product, or process, which has been implemented to make a positive impact. Democracy is an example of a social innovation that has changed continually over time. Artists develop new innovative processes and products with strong impacts on our world. Innovation rarely happens only once. Instead, it is a continuous process.

The activity that follows is designed to introduce the definition and process of innovation. It can be cross-curricular, addressing a number of different subjects. This activity can be adapted to meet the needs and interests of learners. Educators can use this activity to begin a unit of study in curriculum such as Science, Social Studies, Health/Physical Education, and Arts. It can also include Mathematics and Language expectations, as grade appropriate.

### Learning Goals

- Understand the concept of innovation and recognize its impact on our lives.
- Determine a definition of innovation.
- Develop skills of inquiry, initiative, collaboration, and problem-solving.
- Explore some Canadian innovations and their impacts.

## Resources

- *Ingenious and Innovation Nation* by David Johnston and Tom Jenkins
- Light bulbs: LED and incandescent
- Older style phone (such as rotary) and recent cell phone
- Whiteboard or Chart Paper and Post-It Notes
- Video: Canada: A Nation of Innovators: <https://goo.gl/R3aTcU>
- Video: Governor General Innovation Awards: [www.canadianinnovationspace.ca](http://www.canadianinnovationspace.ca)
- Artifacts or images representing Canadian innovations ([Appendix 1A](#))
- Innovation vs. Invention Graphic Organizer ([Appendix 1B](#))
- Exit Ticket ([Appendix 1C](#))
- ‘What is Innovation’ Assessment ([Appendix 1D](#))

## Activating

- Display the word Innovation on a whiteboard, chart paper or other surface. Under the word Innovation, write the words: Examples, Descriptors and Definition.
- Ask learners if they have heard or seen the word innovation at home, school or in the community.
- Show learners the incandescent bulb and the newer LED light bulb. Inform learners that the light bulb is actually a Canadian innovation created by Henry Woodward and Mathew Evans, but Thomas Edison received the patent. Ask learners why the light bulb is important to our world and how the LED version is an improvement.
- Show an older phone (invented by Alexander Graham Bell) and the cell/smart phone as examples of innovations.

## Acquiring and Applying

- Ask learners to identify examples of objects or ideas in their world that might be the result of an innovation. Learners can record their suggestions on Post-It Notes to add to the Examples part of the Innovation board.
- Ask learners to begin to share their understanding of what innovation means with the class. There are likely to be several suggestions such as “good ideas” or “new things”.
- Project or show the chart form Appendix 1A, to show some Canadian innovations.
- Discuss each innovation and use the discussion to check learners’ understandings of the concept of innovation. After naming each item, challenge learners to identify why it is an innovation. Ask whether the innovation is a product (thing) or process (action).
- Discuss how the terms innovation and invention are different. Use a Graphic Organizer (Appendix 1B) and selected images (Appendix 1A) to sort inventions and innovations. The intersection of the circles could represent how an innovation can also be an invention. Invention is the creation of a new item. Innovation may include the creation of a new item, but it can also be the creation or improvement of a product or process. Most inventions are innovations, but not all inventions are an innovation since innovations can be processes and they must also have made an impact. This activity can be done in small groups using the provided template or completed on an interactive white board.
- Show the video Canada: A Nation of Innovators and ask learners to identify some Canadian innovations.

- Ask learners to review the various innovations featured in the video and make list of innovations as class to be included on the Innovation board. After watching the video, learners may be able to recall specific words used as Descriptors of innovation. These terms such as risk-taking, problem-solving and impact may be generated as Descriptors of innovation.

### **Consolidation and Conclusion**

- Create a class definition of Innovation using the following to guide the discussion: Innovation is the creation or improvement of a product (thing) or process (action) to make a positive impact (difference).
- Write the definition under the word Innovation and post it on an Innovation Bulletin Board or in the Innovation Space (see Learning Experience 3). The Innovation Board could also be electronic through a Learning Management System or Google Docs.

### **Assessment**

**Strategy:** Graphic Organizer (1B) and Exit Ticket (1C)

**Tool:** Rating Scale (1D)

In addition to whole group discussion, an exit ticket can be used to assess each learner's comprehension of innovation (Appendix 1C). An assessment tool has been provided and can be accommodated to include the discussion and/or exit ticket (Appendix 1D).

## Canadian Innovations

### What Existed Before

Button



Peanuts



Dollar Bill



Peach Basket



Jacket



### Canadian Innovation

Zipper



Peanut Butter



Loonie












Basketball



Life Jacket



What Existed Before	Canadian Innovation
<p>Telephone</p> 	<p>BlackBerry</p> 
<p>Cardboard Box</p> 	<p>Egg Carton</p> 
<p>Truck</p> 	<p>Dump Truck</p> 
<p>Mask</p> 	<p>Goalie Mask</p> 
<p>Screen</p> 	<p>Multi-Touch Screen</p> 