EDUCATION FOR INNOVATION
Grades 7-12

A Resource Guide for Teachers

E4I

Acknowledgements

Preamble

The *Education for Innovation (E4I) Resource: Grades 7-12* is an instructional framework intended for use with youth approximately twelve to eighteen years of age across Canada. The suggested learning experiences are applicable to school, homeschooling, camp, alternative-educational or recreational settings. Learning experiences were developed to increase understanding of innovation, create awareness of Canadian innovations, and inspire learners to create their own innovations. The terms educators and learners are used to represent a range of teachers and students in various settings.

Goals

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

The learning experiences outlined in this document are open-ended activities which follow the innovation process. The Innovation Cycle, explained in this resource, was developed to clarify the process 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.

The Innovation Cycle (Figure 1), which was designed to reflect the process of innovation, is the foundation of this resource. The phases of the Innovation Cycle are Inquiry, Ideation, Incubation, Implementation, and Impact, which is considered in each phase. Educators are invited to engage their learners in the experiences related to the Innovation Cycle. The experiences described in the present resource can be adapted and applied to various disciplines and course-specific curriculum expectations. The learning experiences offer suggested goals, resources, teaching strategies, and potential assessments.

It is intended that educators can use these innovation learning experiences to integrate with an existing unit of study in any course (or cluster of courses) for Grades 7-12 in Canada. The experiences in this *Education for Innovation (E4I)* resource may be adjusted according to the professional perceptions of educators and the needs or interests of learners. Educators may select to use only the introductory lessons about innovation or also engage learners in completing the culminating Innovation Assignment, which includes a proposal and/or project applicable to a subject/course. Innovation Proposals and Innovation Projects could be presented in multimodal forms at an Innovation Celebration showcasing Canadian student innovations for future generations. The Innovation Celebration can be held in a classroom, school, community, or shared virtually for diverse audiences. Canada has proclaimed National Innovation Week in the month of May to highlight activities related to innovation such as

Innovation Celebrations in schools and communities. A variety of resources, videos and testimonials from educators related to Education for Innovation are available at the site https://canadianinnovationspace.ca/.

The purpose of the *Education for Innovation (E4I)* resource is to provide a framework for educators to adapt and build on as deemed appropriate. There are several activities that educators can use to introduce the concept of innovation and to identify qualities and characteristics of past and current Canadian innovators. Learning experiences are described for educators to use and adjust according to disciplines or courses-specific topics. All of the learning experiences focus on Canadian innovations and how they have impacted the world. The Innovation Cycle is integrated into all activities in order that learners can gain a greater understanding of its importance and applications.

These learning experiences can be aligned with specific topics such as innovations in the areas of health, technology, transportation, communications, the arts, or sports as pertaining to the content of the course. The understandings developed through introductory learning experiences will facilitate the completion of the culminating Innovation Proposal and Project. Educators may integrate course expectations into the assessments and assignments suggested in this resource.
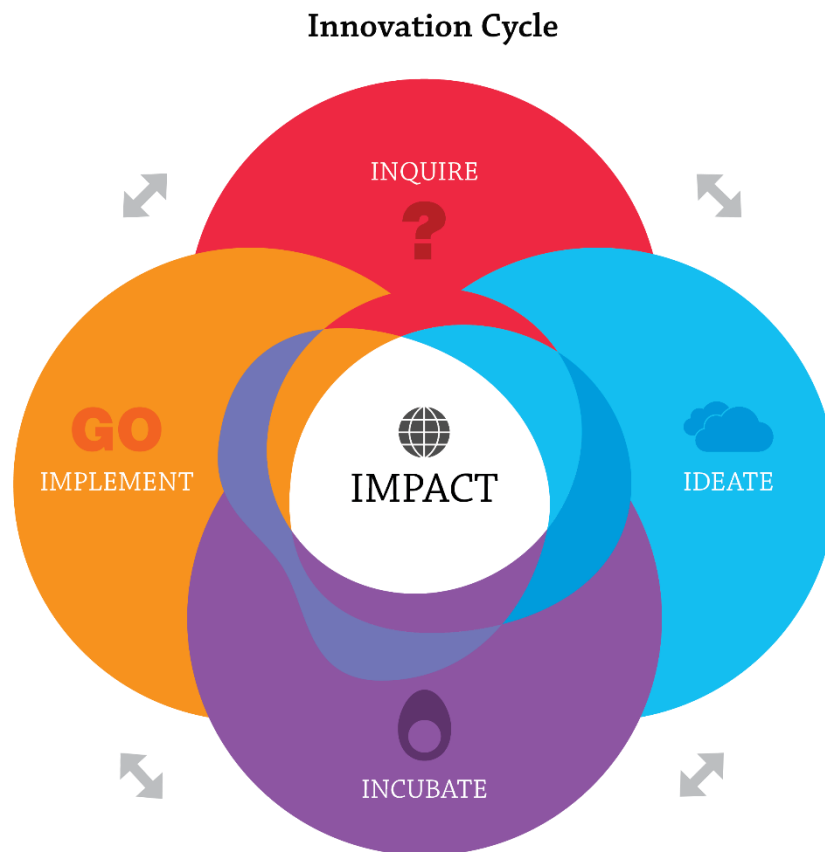
Innovation Cycle

Figure 1

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)* resources; 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*.

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* have been included in this resource and 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 and can be found at https://canadianinnovationspace.ca/category/stories/. Additional stories of Canadian innovators who have received such recognition as the Governor General's Innovation Awards are available at https://canadianinnovationspace.ca/awards/.

Rationale

The term innovation is prevalent in the media, among entrepreneurs, in the realm of social and educational organizations, and most especially in relation to technology. Interestingly, innovation is integral to growth, success, and well-being across all sectors of society. It can be addressed and developed in every subject of educational curriculum. The development of innovative thinking, attitudes, and actions is central to learning in a range of educational settings.

> *To innovate (from innovare, meaning renew or alter) implies a deliberate change in the nature or fashion of something, precisely to make it more useful to more people. To the innovator, impact is the ultimate measure of success. Innovation has always been far more common and, until lately, far less written about than pure invention. Anyone can innovate. We're all curious. We're all creative. When we share our ideas and refine them together, we all have the power of those lone geniuses. When we refuse to act in isolation, when we move away from the presumption that great ideas are conceived in exile, together we become ingenious, which we think is a much better title for a book in our day. Innovation is the creative combination of anything that, once done, makes something better.*
>
> — *Ingenious*, Johnston & Jenkins, 2017 (Page 5)

There is a current imperative to encourage a culture of innovation in education and to integrate innovative thinking, processes, and actions in educational systems, learning expectations, curriculum resources, and pedagogical approaches (Organisation for Economic Cooperation and Development, 2016). Canadian youth are naturally inquisitive and collaborative, seeking to be agents of positive change. Curriculum expectations and teaching guidelines, across Canada and across grade levels, currently include some references specific to Canadian innovations or to the achievement of learning skills related to innovation. The Education for Innovation resource provides the framework for guiding learners in the process of innovation and for enhancing an innovator mindset in Canadian youth.

Definition of Innovation

Innovation is defined differently in various sources and often refers to innovative 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 is achieved through a non-linear, cyclical, repetitive, reflective, and iterative process. An idea becomes an innovation only if it is implemented and has impact. Impact can be measured by a range of outcomes including economic, societal, educational, governmental, health, well-being, and environmental impacts. 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 testing an innovation.

The Learning Experiences outlined in this resource are 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. The suggested activities include resources and teaching strategies related to 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.

Each learning experience can be aligned with curriculum areas by selecting complementary Canadian innovations from *Innovation Nation* or *Ingenious*. 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.

Table of Contents

Learning Experiences

	Synopsis	Resources
Defining Innovation	The definition of the term innovation is provided with an activity to differentiate innovation from invention.	Venn Diagram to explain innovations and inventions (Appendix 1A)

Exploring the Phases of the Innovation Cycle	The innovation process is defined by identifying each phase of the Innovation Cycle. The explanations are accompanied by a series of suggestions for educators and learners. Potential questions and activities are offered that educators might adapt to their instruction. Appendices include graphics, lists and charts for learners.	Innovation Cycle Graphic (Appendix 2A) Innovation Cycle with ELEMENTS Graphic (Appendix 2B) Charts from *Ingenious* Book (Appendix 2C) HERE'S HOW – Get Ready to Innovate
		    Free Your Creativity
		    Think Innovation Before Invention
		    Build an Innovation Ecosystem
		    Improve a Process
		    Improve a Product
		    Lead a Social Change
		    Turn Your Idea into a Business
		    Find Investors for Your Idea
		    Write a Business Plan
		    Launch a Start-up
		    Control the Use of Your Idea

Implementing an Innovation Space	The Innovation Space is described and suggestions are provided for potential formats. This section identifies and provides examples of interactive Innovation Spaces that could be implemented in various learning environments.	Considerations for a Virtual or Physical Innovation Space (Appendix 3A)
Researching Canadian Innovations	This section includes sample learning experiences that can be adapted to a range of discipline(s) or courses topics. The learning experiences focus on Canadian innovations and how they have shaped Canadians' lives. Each activity incorporates the Innovation Cycle to assist learners in developing a greater understanding of how the cycle is used as well as its importance.	Chart of *Ingenious* Innovations Organized by Discipline (Appendix 4A) Innovation Placemat Organizer (Appendix 4B) Exit Ticket Samples (Appendix 4C)

Reflecting on Qualities of Canadian Innovators	This section provides educators with a sample learning experience that can be adapted to a range of disciplines or course topics. This learning experience invites learners to learn more about innovators' qualities by examining and researching Canadian Innovators. Learners will be given the opportunity to assess their own innovator qualities and determine those they possess before and after they engage in activities to develop an innovation.	Chart of *Ingenious* Innovators Organized by Discipline (Appendix 5A) Innovator Exploration Sheet (Appendix 5B) Self-Assessment as an Innovator (Appendix 5C) Innovation Website Coding Lesson (Appendix 5D) Coding Lesson Solution Sheet (Appendix 5E)
Developing an Innovation Proposal and Project	This section invites a team of learners to complete an Innovation Proposal for an Innovation Project by following the phases of the Innovation Cycle. The learners' Innovation Portfolio will document the process and progress, as well as provide educators with a means for assessment. A series of suggested activities and resources have been provided and may be adapted by educators in collaboration with learners.	***Innovation Proposal Templates:*** Innovation Proposal Outline (Appendix 6A) Innovation Proposal Checklist (Appendix 6B1 & Appendix 6B2) Innovation Proposal Brainstorming Sheet (Appendix 6C) Innovation Proposal Template: Sample 1 (Appendix 6D) Innovation Project Template: Sample 2 (Appendix 6E) ***Innovation Incubation Data Collection Templates:*** Innovation Testing Template (Appendix 6F) Sample Interview Questions (Appendix 6G) Sample Survey Questions (Appendix 6H) ***Innovation Assessment Tools:*** Innovation Proposal Rubric (Appendix 6I) Innovation Team Conversation Assessment Tool (Appendix 6J) Innovation Testing Assessment Tool (Appendix 6K! & Appendix 6K2) Innovation Proposal Assessment Tool (Appendix 6L)
Sharing Innovations and the Innovation Celebration	This section provides educators with some suggestions for potential Innovation Celebrations. Considerations for organizing celebrations are outlined along with various models which can be used in learning environments. Innovation Celebrations offer learners the opportunity to showcase and present their new learning and innovation proposals/projects to a range of audiences	Innovation Sharing Checklist (Appendix 7A) Considerations for an Innovation Celebration (Appendix 7B)

Structure & Contents

The structure of the Education for Innovation resource for educators was developed based on the Innovation Cycle (Figure 1/ Appendix 2A) to include:

Inquiry experiences that are designed to address the definition of innovation, the phases of the Innovation Cycle and an overview of the concept of an Innovation Space. Inquiry-based experiences will help learners explore: Canadian innovations and their impact on the world; Canadian innovators and their qualities; and self-assessment of learner's qualities compared to an innovator's mindset.

Ideation experiences which will introduce the challenge of developing an innovation by an Innovation Team of learners. These experiences will challenge learners to interact in a small group, integrate ideas, determine intended impact, and begin to develop an innovation that is related to the unit of study or course. (This is the beginning of the culminating activity of an Innovation Proposal or Project.)

Incubation experiences to provide educators with suggested activities for learners to test and improve their innovations based on experimentation and feedback.

Implementation activities give learners the opportunity to plan the operationalization or launch of their innovation, including developing a proposal with considerations for design, budget, resources, marketing, communications and intellectual property. Implementation may include presentations of Innovation Proposals or Innovation Projects at an Innovation Celebration. The Innovation Celebration can be held in a classroom, school, community centre or presented virtually to showcase the innovations proposed/created by the Innovation Teams. Submissions to the Innovation Celebration could be non-competitive or can be assessed by educators as deemed appropriate.

Defining Innovation

Innovation is a word that is often seen and heard in society and in the media. Yet, it may not be well understood by learners and educators. Innovation is used to describe creations and improvements implemented in every sector and discipline. Canadian innovations such as insulin, the goalie mask, the life jacket, Blue Box recycling, or the Canadarm have made significant impacts on the world.

Many objects have been as a 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?

It is also important to clarify the difference between an invention and an innovation. There are many variations on the definitions of innovation and invention. However, for this resource, the following definitions will be used:

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

Innovation can be the creation of a new item, but it can also be the improvement of a product or process to make an impact. For example, the cell phone has undergone numerous innovations to improve size, speed and functionality. Democracy is an example of a social innovation that has changed continually over time. Artists continue to develop new innovative processes and products that have strong impacts on our world, such as the Group of Seven or Cirque du Soleil. Innovation rarely happens only once; instead, it is a continuous process where essentially every human-made object or idea can be improved with new integrations and iterations.

Suggested prompts for educators

- The Venn Diagram (Appendix 1A) can be used to help learners to distinguish between an invention and an innovation; the left circle is for product Inventions that may not have made an impact. The right circle signifies process Innovations that made an impact and the overlapping area signifies product Inventions and Innovations that made an impact.
- Discuss the different types of innovations and their corresponding impacts.
- Use the activities in Part 4 to provide learning experiences exploring the definition of Innovation and impacts of Canadian Innovations.
- Explore how impacts can be both positive and negative with unintended consequences

INNOVATION

INVENTION
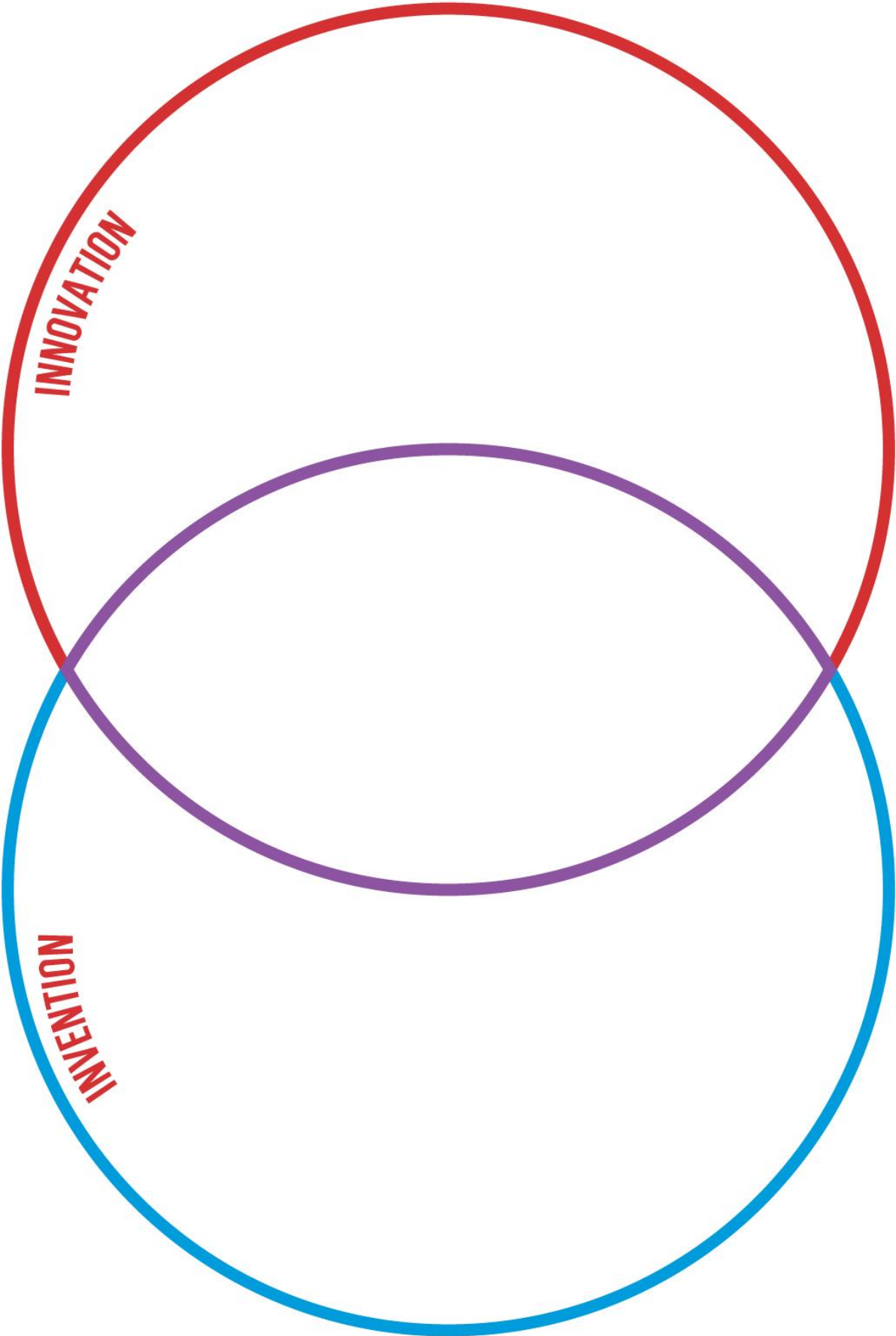
Exploring the Phases of the Innovation Cycle

The Innovation Cycle was developed based on an analysis of the innovation process, a review of the related literature on innovation and a synthesis of the suggestions offered in the book *Ingenious*. The Innovation Cycle follows a series of phases: Inquiry, Ideation, Incubation, and Implementation. In each phase, innovators consider the critical issue of Impact which is the reason that impact is central in the cycle. Innovation is a cyclical, repetitive and iterative process with constant revisiting and revising. The Innovation Cycle is described to provide a background for educators before engaging learners in developing an Innovation Proposal or Innovation Project.

The four phases of the Innovation Cycle are colour-coded with accompanying icons to help learners associate concepts and terms with each phase.

Two graphics are provided to assist educators and learners to become familiar with the phases of the Innovation Cycle (Appendix 2A and 2B).

- Appendix 2A includes terms associated with each phase of the Innovation Cycle.
- Appendix 2B includes a learner- friendly version of the Innovation Cycle. This version includes key words for each phase for easier recall and understanding.
- Inquiry Phase: The Question Mark signifies investigating.
- Ideation Phase: The Blue Sky symbolizes thinking big, reminiscent of expressions such as 'sky is the limit with ideas' or to 'blue sky it' meaning 'think big'.
- Incubation Phase: The Egg Incubator symbolizes testing, experimentation, growth and improvement.
- Implementation Phase: The Go symbol was chosen to symbolize the innovation being prepared for action, production, launch, or distribution.

Suggested prompts for educators:
- Analyze the graphic in Appendix 2A with learners by discussing the four phases, the related terms for each phase and the rationale for Impact being placed in the center, overlapping over each phase.
- Discuss how the overlapping circles indicate that the phases are connected and can be revisited.
- Indicate that all phases of the cycle begin with the letter I, including the aspects within each phase. This can make it easier to remember them.
- Have learners guess why the symbols are used in Appendix 2B and how they appropriately represent each phase.
- Debate if impact is always positive and how there may be unintended impacts of innovation.

INQUIRY

Inspiration
Imagination
Investigation

IMPLEMENTATION

Intellectual property
Investments
Incorporation

IMPACT

IDEATION

Initiative
Interactions
Integrations

INCUBATION

Impediments
Improvements
Iterations
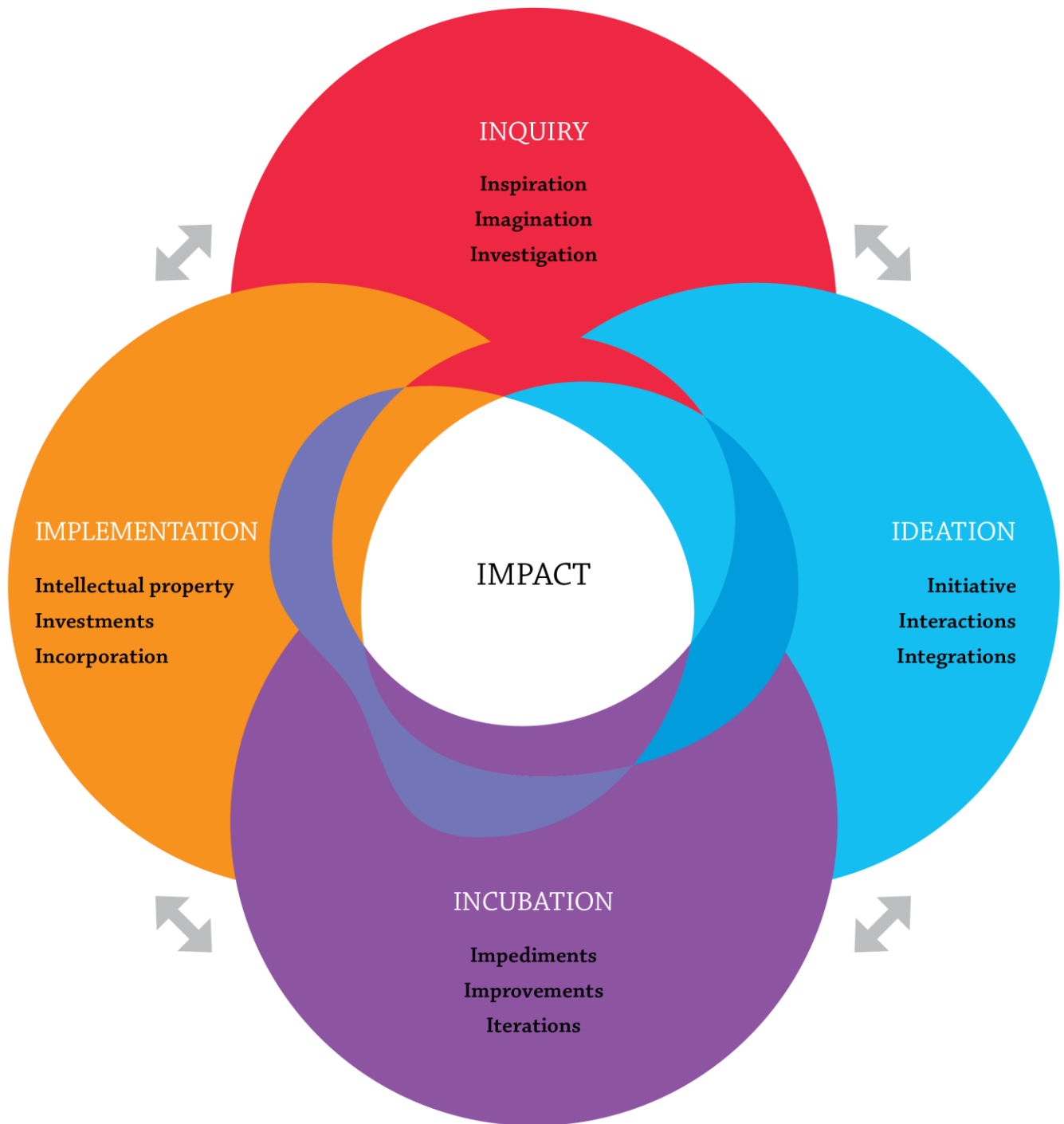
Think and Act like an Innovator

Innovators determine the Impact that they wish to make to improve our world. They Inquire about past and current innovations to gain information. Then, they Ideate a new innovation by designing a model or prototype. In the next phase, innovators Incubate their innovation as they test and make improvements, continually revisiting the intended Impact. Finally, they make plans to Implement the innovation including considerations for budgets, marketing, intellectual property and distribution. Assessing the impact is an indicator of success.

INQUIRY

Research past innovations and present issues. What inpires you?

Research Canadian innovators. Who inspires you?

Determine what issue you would like to address.

What might you innovate to have a positive impact?

IMPLEMENTATION

What is your plan for implementing the innovation?

How will you share and protect the innovation idea?

Do you need investments or other resources?

How will the impact of the innovation be measured?

IDEATION

Continue to brainstorm an idea for your innovation.

Who can you work with to develop your idea?

Can you make connections to other ideas?

What impact do you want your innovation to have?

IMPACT

How does this innovation make a difference in our world?

What are your goals for the innovation?

How will you know your innovation was successful?

INCUBATION

Does the innovation have the impact you intended?

What are some challenges or impediments to the innovation?

How will you test your innovation?

How will you improve the innovation based on the feedback that you receive?

Exploring the Phases of the Innovation Cycle (continued)

Impact

The most important purpose of innovation is to make a positive impact. This is why Impact is at the center of the Innovation Cycle and therefore it is a consideration in every phase. Initially, innovators need to determine what kind of impact they wish to make with their new innovation. Usually innovations solve a problem or address a need, but they can also create something new by integrating and improving pre-existing ideas. During each phase, innovators need to determine if the innovation is effective in making the desired impact. Unintended consequences and unexpected impacts will present challenges to innovators.

The role of Impact in each phase:
- In the **Inquiry Phase**, innovators decide the impact they wish to make and conduct research to collect information on how to achieve the impact goal.
- In the **Ideation Phase**, innovators think of, design and create an innovation to address the impact.
- In the **Incubation Phase**, innovators test and experiment with their innovation, collect feedback from users or potential clients and determine if the intended impact is being achieved. Improvements may need to be made to reach the impact goal.
- In the **Implementation Phase**, innovators will continually assess the intended impact and form the implementation plan to reach the impact goal. Tools and indicators can be adjusted as needed to measure success.

Suggested prompts for educators:
- Watch the video 'How do Innovators Innovate?' and discuss the definition of innovation, phases, examples and types of impact: https://canadianinnovationspace.ca/resources/what-exactly-is-innovation/
- Review the meaning of the word impact and discuss synonyms such as difference, positive effect, or success.
- Discuss different kinds of impact such as financial, safety, health, efficiency, or entertainment
- Use the activities in Part 4 of this resource to examine the impact of Canadian innovations.
- Discuss some of the impacts that learners plan to make with their innovation project.
- Ask learners to research Canadian innovations from *Ingenious* and discuss their impact.
- Ask learners to research recent innovations related to the current subject/course and discover the intended and unintended impacts.
- Review current events in the media and debate if the media influences perceptions of impact.
- Review the Innovation for Good Declaration at the end of this document to determine if the six principles address potential positive and negative effects of impact
- Reflect on current innovations that have had both a positive and negative impact.

Inquiry Phase
Asking, Questioning, and Investigating (Red)

Innovators inquire and ask questions. The Inquiry phase includes:
- Inspiration: What or who inspires innovators?

- Investigation: What can be learned from past and present innovations?
- Imagination: How can an innovation be envisioned or created?
- Impact: What are the issues or problems that need to be addressed?

The Inquiry Phase is the initial phase, engaging learners to use research and critical thinking skills to identify issues and problems. Ideally learners will be provided with flexibility when investigating their interests related to a range of topics, and have access to a variety of research tools and strategies. Inquiry processes can include gathering information about current innovations and how they address certain issues, and creating profiles of potential new innovations and the users of proposed innovations.

Data-driven decision making should be a consideration in the Inquiry Phase. Learners should consider primary and/or secondary research findings as they develop their innovation. For example, if a learner was thinking of innovating cell phones, they might collect primary data from a survey administered to cell phone users. For secondary data, they might access Statistics Canada to research business and government spending on mobile technology. The Inquiry Phase can include researching stories of past innovations and innovators to determine the skills and processes that have been impactful and successful.

Inquiry is the basis of all decision-making throughout the innovation process and this phase is revisited throughout all other phases.

Resources
- *Ingenious* by David Johnston and Tom Jenkins (Charts in [Appendix 2C](#))
- INNOVATION: HERE'S HOW
  - o Get Ready to Innovate
  - o Free Your Creativity
  - o Think Innovation Before Invention
- Innovation Cycle Graphic(s)
- [Appendix 2A](#) and [Appendix 2B](#)

Suggested prompts for educators:
- Review the Graphic in Appendix 2A, discussing the aspects within the Inquiry Phase.
- Review the Graphic in Appendix 2B and the questions associated with the Inquiry Phase.
- Provide learners with lists from *Ingenious* such as Get Ready to Innovate and Free Your Creativity to explore suggestions for initiating an innovation (Appendix 2C).
- Provide examples of how research and inquiry determine necessary innovations that will be profitable and impactful.
- Ask learners to find a range of sources for data and information to provide a basis or rationale for an innovation.
- Use the activities in Part 4 to investigate various Canadian innovations and the qualities and characteristics of innovators.
- Encourage ongoing inquiry, research, critical thinking and problem-solving throughout the innovation process.

Ideation Phase
The sky is the limit when creating ideas (Blue)

Innovators engage in developing ideas. The Ideation Phase includes:
- Interaction: Who can innovators work with? (Mentors, peers, experts)
- Integration: How can links between various ideas be made?
- Initiative: What is the drive and motivation needed to develop an innovation?
- Impact: What are the intended goals of the innovation?

The Ideation Phase of the Innovation Cycle includes the design and creation of an innovation model. In some cases, an innovation is an actual product, and in other cases an innovation is a proposal for a new or improved process, service, or organization. Resources, materials and research tools are necessary throughout this phase.

Some resources may be accessed from the Innovation Space (described in Part 3) Professionals and members of the community are also key in providing support. Other resources may include mentors from local start-up incubators and regional small business centres. Innovations are usually created by a team of people with complementary skills. Thus, collaboration among innovators is important. Often, an innovation is the integration of various existing concepts. The innovation process takes time and might involve multiple versions of the innovation to achieve the impact goal. The development of a prototype or model is an important part of the Ideation Phase and can require numerous attempts and iterations based on testing and feedback.

Resources
- *Ingenious* by David Johnston and Tom Jenkins (Chart in Appendix 2C)
- INNOVATION: HERE'S HOW — Build an Innovation Ecosystem
- Innovation Cycle Graphic
- Appendix 2A and Appendix 2B

Suggested prompts for educators:
- Review Appendix 2A and discuss the elements of the Ideation Phase.
- Review Appendix 2B and discuss the questions associated with the Ideation Phase.
- Review the chart in Appendix 2C and discuss how to build an innovation ecosystem.
- Ask learners to reflect on the innovation process and how ideas are based on an intended impact or an attempt to meet a need.
- Ask learners to determine the resources required to create, design or make an innovation.
- Discuss how an idea for innovation can be developed and designed to meet a desired impact, such as the example of the need to reduce waste led to the blue box recycling program.
- Encourage learners to reflect on some innovations result from the integration or improvement of past innovations and inventions such as the Blackberry was the integration of a pager and a cell phone.

Incubation Phase
Testing, improving, and growing (Purple)

Innovators need time to test and modify ideas. The Incubation phase includes:
- Impediments: What are possible challenges or obstacles?
- Improvements: How can the innovation be enhanced or improved based on testing and feedback?
- Iterations: What different versions of the innovation might work better?
- Impact: Is the innovation meeting the intended impact goal(s)?

The Incubation Phase occurs once learners have completed the design of the innovation and developed a prototype or proposal. It is the time to test and improve the innovation. Learners should think about their innovation and ask others to provide feedback. The presence and support of mentors and experts is useful in this phase. Learners may wish to interview others about their innovation to obtain perceptions about usage, cost and target audience. Formal and informal data is collected about the innovation to determine if it is meeting the intended goal(s) and. The innovation is sometimes included in experiments to assess its effectiveness under varied conditions and with a range of participants. Learners should continue to inquire during this phase, as they gain understandings about the impediments and challenges they will face in the Implementation Phase. Iterations and improvements of innovations may be necessary to achieve the desired impact. Start-up businesses and social innovations are often located in accelerator centres or community incubators for testing and improvement before full implementation.

Resources
- *Ingenious* by David Johnston and Tom Jenkins (Charts in Appendix 2C)
- INNOVATION: HERE'S HOW
  - o   Improve a Process
  - o   Improve a Product
- Innovation Cycle Graphic
- Appendix 2A and Appendix 2B

Suggested prompts for educators:
- Review Appendix 2A and discuss the steps within the Incubation Phase.
- Review Appendix 2B and discuss the questions associated with the Incubation Phase.
- Review and discuss the charts from *Ingenious* (Appendix 2C).
- Ask learners to brainstorm various methods for data collection to test and improve an innovation.

Implementation Phase
Planning for action and sharing (Orange)

Innovators need to put their ideas into action. In the implementation phase, innovators develop a project proposal which may include the final design of the innovation, marketing, tasks, materials, budget, responsibilities and timelines. The fourth phase includes consideration of:

- Intellectual Property: How is the concept protected?
- Investment: Is there a need for fiscal resources or investors to support the innovation?
- Incorporation: Should the innovation be registered as a business or organization?

- Impact: What are the indicators of impact? How is success measured and has the innovation achieved the intended goal(s)?

The Implementation Phase involves plans for preparing the innovation for a launching or operationalization. Elements of this phase include determining the final design or model, the marketing plan, advertising and budgeting. Depending on the subject, curriculum or discipline being explored, educators may find these components are critical elements of the innovation assignment. In other cases, or courses, this implementation phase may involve elements that are beyond the subject expectations. Ideally, learners should explore various aspects of implementation based on the nature and parameters of the course material.

Resources
- *Ingenious* by David Johnston and Tom Jenkins (Charts in Appendix 2C)
- INNOVATION: HERE'S HOW
  - Lead a Social Change
  - Turn Your Idea into a Business
  - Find Investors for Your Idea
  - Write a Business Plan
  - Launch a Start-up
  - Control the Use of Your Idea
- Innovation Cycle Graphic
- Appendix 2A and Appendix 2B

Suggested prompts for educators:
- Review Appendix 2A and discuss the steps in the Implementation Phase.
- Review Appendix 2B and discuss the questions associated with the Implementation Phase.
- Use the Charts in Appendix 2C to introduce and review processes of innovation.
- Determine possible tasks and roles for developing an implementation plan.
- Debate the issue of intellectual property and how ideas are protected.
- Reflect on implementing a social innovation versus a business innovation.
- Discuss the merits of having investors and responsibilities to the investors.

GET READY TO INNOVATE: HERE'S HOW.

☐ Admit that everyone is creative.

☐ Ask people about their own innovative ideas, and let their thoughts inspire you.

☐ Keep a notebook of innovative ideas in all areas that interest you.

☐ Talk to people about your ideas and be guided by their feedback.

☐ Build a team, knowing that good ideas become great when people collaborate.

☐ Expect great results. Your belief in the possible is the sure route to innovation.

☐ Be persistent, knowing that all successful innovations have had many prototypes.

FREE YOUR CREATIVITY: HERE'S HOW.

☐ Be active in disciplines other than your own.

☐ Go for a walk, knowing you'll get your best ideas away from the computer.

☐ Doodle. Make a mess and let your mind follow the pen or pencil.

☐ Write ideas within circles connected by lines to other ideas that relate.

☐ Roll large marbles or pebbles in your left hand to stimulate your creative right brain.

☐ Write on paper first, and refine your wording with a word processor only later.

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IMPROVE A PROCESS: HERE'S HOW.

☐ Identify any series of steps by which something is done repetitively.

☐ Clearly define the *ultimate goal* of that process.

☐ Break the process down into its single steps, and identify who is responsible for each.

☐ Remove any step that does not contribute to the ultimate goal of the process.

☐ Add any other step that helps reach the goal faster or better.

☐ Reassign any step that could be better done by someone else.

☐ Automate any process only when its outcome is perfectly consistent and desirable.

IMPROVE A PRODUCT: HERE'S HOW.

☐ Find a product or object that needs improving.

☐ Identify features of competitive products, and make a list of desirable improvements.

☐ Be honest about which improvements your customers need and would pay for.

☐ Figure out what resources of money, people, and time you need to make the top improvements. Start working only when you have those resources in place.

☐ Work through many prototypes, noting how and why things fail, sharing your findings with your whole team.

LEAD A SOCIAL CHANGE: HERE'S HOW.

☐ Form a team of change leaders from all sectors and levels of the community or organization.

☐ Create a clear vision of how things will look when the change is made, and establish a sense of urgency.

☐ Empower others to take action that helps achieve the vision, but let them choose how. Let them communicate the vision far and wide.

☐ Define, plan for, and measure short-term success.

☐ Consolidate the improvements and create still more change.

☐ Imbed the new approaches into the community culture by celebrating and repeating.

* Adapted from *Leading Change* by John P. Kotter, 1990

BUILD AN INNOVATION ECOSYSTEM: HERE'S HOW.

☐ Connect with organizations and people who believe that innovation is necessary and good.

☐ Find partners who share your values, and who will prosper through their relationship with you.

☐ Build groups of partners within your particular region (e.g., Waterloo, Ontario), platform (e.g., iOS), or industry (e.g., fast food).

☐ Find suppliers who can ensure a steady flow of parts and materials at competitive prices, even when you scale up.

☐ Test your ecosystem with a small project that involves each partner, and note any functions that you're missing or duplicating.

☐ Don't get greedy. Make sure that successes in all your joint projects benefit *all* players in the ecosystem.

WRITE A BUSINESS PLAN: HERE'S HOW.

☐ Be aware that your business plan is the tool investors and partners will want to study before they decide to get involved.

☐ Think of your plan as your most current, most honest view of how your business will operate and succeed. Update it regularly. Refer to it often to see if you've hit the milestones you said you would.

☐ Create an executive summary (perhaps as a digital presentation) to tell your story briefly.

☐ Practise presenting the contents of your plan as a story about your business and your vision. It is through this pitch that investors will be able to grasp your idea, your product, your market opportunity, and your plan of execution.

TURN YOUR IDEA INTO
A BUSINESS: HERE'S HOW.

☐ Develop your idea into a fully formed concept, then simplify it so you can easily describe it to others.

☐ Discuss your idea with people you trust, then identify flaws and make improvements.

☐ Incorporate a company.

☐ Build a prototype, often called a minimal viable product (MVP).

☐ Discover what your customers' problem is and find out how many customers have that problem.

☐ Spell out the value that solving the problem will create for those customers.

☐ Refine your prototype until you have a solid product that directly addresses the problem.

☐ Have your customer use the product (even in prototype form) to see if it really does solve the problem.

☐ Ask your customers if they will pay for the minimal viable product. If not, improve it again and again until they say they want it. When customers will actually pay for your product, you have a business.

LAUNCH A START-UP: HERE'S HOW.

☐ Find one or two co-founders with complementary skills who agree with your business vision and who would like to work with you for a long time.

☐ Sort out the split of company ownership early on.

☐ Incorporate and put some money into the company.

☐ Ask for help with your start-up from your government's Industrial Research Assistance Program or equivalent. Find out what that group can do for you, and what it will require of you in return.

☐ Build your prototype based on customer discovery.

☐ Show friends and family your prototype and see if they will contribute some financing.

☐ Find a cost-effective place to work with your team – either at home or at a business accelerator. Save your money for building your product and validating your market opportunity with early customers.

FIND INVESTORS FOR YOUR IDEA: HERE'S HOW.

☐ Know that the best source of funding are the customers who pay for your product. Only when you have to grow fast, acquire more customers, build more tech, hire more people, and cement partnerships should you need investment capital.

☐ Find a mentor, and join a business accelerator where you can learn how to attract both customers and investors.

☐ Refine your investor pitch by asking entrepreneurs in residence to poke holes in your value proposition.

☐ Identify the type of investor you want, and consider what they might provide other than money, including mentorship, contacts, customers, technology, credibility.

☐ Talk to companies that got investment from your target investors. Get feedback on the style and preferences of each. Find out what works best in each case.

☐ Engage a corporate legal firm to structure your company properly for investment. Ask if they have a start-up package.

☐ Be prepared to give a reasonable percentage of your company to your investors. It's not bad to have only a small percentage of what might become a huge success.

☐ Know exactly how you will use the investment funds to get to a defined milestone.

☐ Be upfront when you pitch. Answer every question directly. Never exaggerate. Make your projections conservative. Acknowledge that you have competitors. Admit when you don't know something, and pledge to get back to them later.

☐ Get used to being rejected. Investors' perspectives are different from yours. Learn, adapt, persist.

CONTROL THE USE OF YOUR IDEA: HERE'S HOW.

While innovation depends on widely shared ideas, many nations (including Canada) allow creative thinkers the exclusive commercial right to implement their ideas for specified ranges of time. Ideas protected in this way are referred to as intellectual property or IP. Here are steps you can take to control your own IP.

☐ Create an IP strategy early on suited to the industrial sector you operate in, the type of IP you want to protect, and your financial capacity to defend that IP down the road.

☐ Put a solid technical writer on your team to draft provisional patents with one or more patent ideas each. Track which of those ideas are most valuable to your firm in the first year.

☐ Search for and respect other people's patents and barriers such as registered marks. This will avoid later legal interruptions.

☐ Have an IP lawyer help you create clear title to the ideas you want to control, with enforceable employment and contractor agreements that assign title to all IP, including patents, copy-rights, trade secrets and moral works. Ensure that employees and contractors enter into and re-acknowledge those agreements every year.

☐ Get a corporate legal firm to help. Keep costs down by choosing a firm that offers an IP start-up package. Apply for patents, and also ask for help to protect your trade secrets and industrial design with confidentiality agreements and other tools.

☐ If someone claims you are infringing an existing patent, get legal assistance right away.

Implementing an Innovation Space

Background
To help learners understand the process of innovation, it is important to provide resources and opportunities that reflect an innovative culture. An Innovation Space is a designated area in a classroom, school, or other setting that provides learners with a temporary or permanent setting to examine, develop, plan, make, create, test and improve innovations on an ongoing basis. Some schools have a Makerspace with art and building materials which can be expanded into an Innovation Space, broadening its capacity and scope to include the development of social innovations. The Innovation Space is a dedicated location for displaying Canadian innovations; learners can contribute by adding artifacts from home or examples from the media, stories, and articles. The Innovation Space can also be a hub for researching innovations and showcasing learner-created Innovation Projects at various stages of completion. It does not need to be a physical space; many educators/schools have chosen to use virtual environments to host innovation-related examples, information and resources for learners to explore. Whether physical or virtual, it should be a supportive space for learners as they develop their Innovation Proposals/Projects.

Learning Goals
- Collaboratively develop and contribute to an Innovation Space.
- Apply and extend acquired knowledge of the Innovation Cycle to the Innovation Space.
- Demonstrate collaboration through researching and innovating with their peers and mentors.
- Identify and research Canadian innovations as related to the chosen curriculum.
- Use the materials at the Innovation Space to create, test and implement innovations.

Learning Experiences
At any phase of the Innovation Cycle, learners may use the Innovation Space to:

- Examine the merit of innovations in light of research and collected data;
- Develop innovations while considering impact;
- Plan to construct and implement the innovation;
- Make decisions in a collaborative way;
- Create models to assess and evaluate effectiveness;
- Test innovations using data analysis and critical thinking skills;
- Improve innovations by seeking ongoing feedback.

Considerations for a Virtual or Physical Innovation Space

Resources
There may be variations of both physical and virtual Innovation Spaces. Educators should consider including:

- A breadth and depth of learning experiences accessible to learners;
- A range of resources that may be clustered such as tablets, mobile devices, computers, scanners, 3D printers;
- Art supplies or other appropriate resources for cross-discipline learning and design;
- A virtual platform for off-site accessibility to resources, research and discussion;
- Mentors including peers, educators and community members.

Interactions
There may be variations in the types of interactions and human resources available at an Innovation Space. Considerations should be given to the following:

- Educators with subject-area expertise should be accessible to cross-discipline groups, individual classes or groups /individuals outside of class time.
- Opportunities for collaboration among educators and cross-discipline program delivery need to be considered from a scheduling perspective.
- Online spaces should include a method for learners to share their innovations during the cycle as well as when completed.
- Learners should be able to share content to a physical or virtual site for viewing by peers and possible mentors. A significant advantage to an online space is the audience is increased and diversified. This allows for mentoring and comments from beyond the school community.
- Possible design considerations might include the creation of websites, online classrooms, blogs, twitter, shared hashtags and links to innovation website resources.
- As with all platforms, educators should monitor to ensure safe and appropriate use of resources and posting.

Researching Canadian Innovations
What are the Impacts of Innovations?

Background

An important aspect of innovation is **Impact** which implies the difference that an innovation makes on the world. The impact of an innovation can be efficiency, safety, empathy, health, communications, entertainment, economy, profits, governance, and so on.

For example, innovation may result in one or more of the following differences/impacts:
- A product that is more efficient, compact, interesting, aesthetically pleasing, or safer
- A process that is easier to understand, more accessible, safer, more environmentally responsible, more diverse, or more effective.

Learners will benefit from reflecting on the impact of past innovations and begin to determine the impact they wish to make with a new innovation. The desired impact of a new innovation will affect the design; it is important to continually assess impact throughout the Innovation Cycle. In this activity, educators can encourage learners to discuss potential negative impacts of innovations.

Learning Goals
- Understand the concept of innovation and to recognize its impact on our lives;
- Develop skills of inquiry, initiative, collaboration, and problem-solving;
- Discover and discuss Canadian innovations and their impacts.
- Determine the principles for positive impact: Innovation for Good.

Resources
- *Ingenious* by David Johnston and Tom Jenkins
- 8-10 Canadian innovations based on discipline, selected by educator to complement course
- Videos of *Ingenious* Canadian Innovations (zipper, lifejacket, peanut butter, touch screen): https://canadianinnovationspace.ca/category/stories/
- Governor General's Innovation Awards video "We Did This': https://innovation.gg.ca/about/
- Chart of *Ingenious* Innovations Organized by Discipline (Appendix 4A)
- Innovation Placemat Organizer (Appendix 4B)
- Exit Ticket Samples (Appendix 4C)
- Innovation for Good Declaration

Activating
- Write INNOVATION in the middle of a whiteboard or anchor chart (to be used for future reference). At this time, do not reveal the broad definition of innovation given in the background. Present learners an innovative product or process (such as an incandescent light bulb) without revealing it is an innovation. Ask the learners why the light bulb is important to our world and how current versions are an improvement.
- Invite learners in small groups to brainstorm what they think is meant by innovation. The educator may ask them to define 'innovation' or to identify examples in the world of a product or process that might be the result of an innovation and explain their rationale for the definition(s) they provide.
- Have the groups share their understanding of what innovation means with the class.

- Read the following list aloud, one item at a time, and use it to check understanding of the concept of innovation. After reading each item, challenge them to identify whether or not an innovation occurred (thumbs up/down) and why:

> button to zipper (yes)
> dollar bill to loonie (yes)
> widening a road from two lanes to six lanes of traffic (no)
> computer monitor to multi-touch screen (yes)
> painting a bedroom in a new colour (no)
> peanuts to peanut butter (debatable; use as a chance to hear both sides and have learners discuss their opinion)

Acquiring and Applying
- Watch one or more of the videos available on www.https://canadianinnovationspace.ca/ on Canadian innovations such as the life jacket, touch screen, zipper or peanut butter. Have learners discuss why these are important Canadian innovations and describe their history and development. *We Did This* video: https://innovation.gg.ca/about/.
- Distribute 8-10 placemats (Appendix 4B) with corresponding innovations (found in *Ingenious*) selected to complement course content on tables around the classroom. Educators may access stories on www.https://canadianinnovationspace.ca/ or photocopy the selected innovations from the book to accommodate each station. Write the name of each innovation on a corresponding placemat.
- Organize learners into groups according to the number of innovations being explored. For example, if there are eight stations, organize the learners into eight groups.
- Groups are to examine and discuss the innovation at their station, and then contribute no more than 1-2 answers or ideas per placemat section. Rotate the groups from one placemat to another after designated time intervals (suggested 3-5 minutes per station).
- When they move to the next station, they should contribute additional ideas without repeating responses from previous groups. With each new rotation, it will become more difficult to offer new ideas. Educators should encourage learners to become increasingly creative, innovative, and to persevere when contributing new thoughts.
- Monitor groups and ask open-ended questions to help learners who are having difficulty contributing to their innovation.

Consolidation and Conclusion
- Once they have returned to their original placemat, allow learners a few minutes to review the other groups' contributions to the innovation.
- Ask each group to share the completed placemat with the class.
- Now ask learners to vote on one innovation that has had the greatest impact on their lives. Select how voting will be documented: Google Forms, Exit Card (Appendix 4C), Show of Hands
- Review the Innovation for Good Declaration and discuss how the six principles apply to the innovations examined in this learning experience
- Invite learners to reflect on their experience:
  - How did their contributions change from station to station?
  - What other problem(s) did they face?
  - How did they solve problem(s)?
  - How did working in a group assist or hinder each learner's contributions?
  - How do they think their experience with this activity compares to what a real-life innovator might go through?

31

Chart of *Ingenious* Innovators

Visual Arts	Drama	Media Arts
Art as Innovation Developing Tank Group of Seven Paint Roller	Cirque du Soleil Commercial Documentary Film Juste Pour Rire Saturday Night Live Superstardom Yuk Yuk's	Brownie Camera Commercial Digital Photography Dinner Theatre Half Tone IMAX Instant Replay Movie Theatre Multi-Dynamic Image Multiplex Cinema National Film Board Panoramic Camera Superman (Comic)

Music		
Gould's Musical Technology Synthesizer		

Business & Economics	Geography	History
	Abeego	
Argan Oil Cooperative	Argan Oil Cooperative	Aircraft Mass Production
Caisse Populaire	Avalanche Protection	Black Brant
Cirque Du Soleil	Baggage Tag	Canadian Dictionary Of
Colour Coins	Blue Box Recycling	Biography
Derivative Valuation	Brunton Compass	Canoe
Easy-Off	De Havilland Beaver	Curtiss Canuck
Euro	Ecotraction	Flag Colour Standards Flexi-Coil
Greenback	End of Grain Rust	Air Seeder
Handset	Experimental Farms	Gas Mask
Intelligent Teapot	Fish Ladder	Marquis Wheat
Interest Calculator	Garbage Bag	North-West Mounted Police
Juste Pour Rire	Inuit Arctic Research	Project Habakkuk
Loonie	Kerosene Mount Logan	Pulp and Paper
Me To We	Barometer	Russel Logging Boat
National Research Council of	Marquis Wheat	Straw-Gas Car
Canada	Plate Tectonics	Telephone
Plexiglass	National Atlas	Transcontinental Railroad
Second Cup	Oil Drilling	Truth with Reconciliation
Radio Voice Transmission	Oil Pipeline	
Retail Cosmetics	Project Habakkuk	
Right to Play	Rod Weeder (Agriculture)	
Uneven Incentives	Sakkijânginnatuk Nunalik	
Yuk Yuk's	Smokejumper	
	Standard Time	
	Straw-Gas Car	
	Xylanase	

Native Studies		English
Canadian Aboriginal Syllabics Canoe (First Nations) Cradleboard Dogsled (Inuit) Duck Decoy (Ojibway) Igloo Inuit Arctic Research (Inuit) Kayak (Inuktitut) Lacrosse (Indigenous Peoples) Life Jacket (Inuit)	Longhouse Moccasin (First Nations) Potlatch Red River Cart (Métis) Sakkijânginnatuk Nunalik Snow (Inuit) Snow Goggles (Inuit) Snowshoes Toboggan (First Nations) Truth with Reconciliation	Enlightenment Short Story Syndicated Journalism
		Mathematics
		Igloo Interest Calculator Odometer Ships' Knees

Law & Civics	Health	Physical Education
Accessible Bus Aids for The Blind Climate Rights Computerized Braille Confederation of Canadian Unions Declaration of Human Rights Homeless Hub North-West Mounted Police Nunavut Peacekeeping Restorative Justice Truth with Reconciliation	ACTAR 911 Herswab HIV Cocktail Insulin Sulcabrush Rapid HIV Test Xagenic 2012	Basketball Clip-On Ice Skates Five-Pin Bowling Goalie Mask Hockey Lacrosse Laser Dinghy Mulligan Pealess Whistle Stanley Cup

Physics		Chemistry
Alouette Satellite ASDIC CANDU Reactor Compound Steam Engine Crash Position Indicator Great Sound Diver's Air Tank Foghorn G-Suit Law of Absolute Zero Light Bulb Liquid Helium	Molecular Spectroscopy Neutrino Mass Neutron Scattering Nuclear Physics Particle Physics Robertson Screw (Torque) Silver Dart Snow Goggles Stem Antenna Streamlined Locomotive Thermal Windows Zombie Stars	Alkaline Battery Atomic Recoil Bomb Sniffer Chemical Bridge Electron Microscope Electron Transfer Theory Ecotraction Kerosene Liquid Helium Molecular Spectroscopy Reaction Dynamics Reverse Osmosis Thermofloat Coat

Biology		Earth & Space
Atlas of The Heart	Hormone Treatment	Canadarm
Cancer Bomb	Meningitis Vaccine Montreal	Space Vision
Catalytic RNA	Procedure	Stars in Globular Clusters
Cattle Plague Vaccine	Pacemaker	
Dendritic Cell	Stem Cells	
DNA-Based Chemistry	Surgical Curare	
End of Grain Rust	T-Cell Receptor	
Forensic Pathology	Telesurgery	
Insulin	Telomeres	
G-Suit	Visual Neurophysiology	
HIV Cocktail	Wound Diagnostics	
Hodgkin's Cure		

Food & Nutrition		Family Studies
Bloody Caesar	Ice Cider	Easy-Off
Buckley's Mixture	Instant Mashed Potatoes	Electric Radio
Butter Tart	Key-Opener Cans	Electric Range
Bovril	Maple Syrup	Ironing Board
Canada Dry	McIntosh Apple	Jolly Jumper
Canadian Bacon	Nanaimo Bars	Longhouse
Canned Lobster	Peanut Butter	Monitor Top Fridge
Canola	Poutine	Pablum
Chicken Bones	Sardine Tin	Wringer Washer
Chocolate Bar	Shreddies	
Coffee Crisp	Solid Honey	
Crispy Crunch	Yukon Gold	
Egg Carton		

Sociology		Fashion
Breakfast for Learning	Superstardom	Buffalo Coat
Cradleboard	Trivial Pursuit	Flag Colour Standards
Language Theory	Very Early Language Learning	Long Johns
Longhouse	Whoopie Cushion	Moccasin
Me To We	Wood-Tile Crossword	Waterproof Shoes
Right To Play		Wonderbra
		Zipper

Transportation	Health Care	Manufacturing
Back-Up Light	Air Ambulance	Air Seeder
Compound Steam Engine	Electric Wheelchair	Jerker Line
Disappearing Propeller	Hodgkin's Cure	Railway Air Conditioning
Dump Truck	Hormone Treatment	Rotary Ventilator
Helicopter Cushion	Itclamp	Self-Propelled Combine Harvester
Road Lines	Microsurgical Staple Gun	Sorghum Decorticator
Miovision	Meningitis Vaccine	Tempered-Steel Rails
Ship's Propeller	Montreal Procedure	Variable Pitch Propeller
Ski-Doo	Pablum	Weatherstrip
Snowmobile	Prosthetic Hand	

		Technological Design
Snowplane	Rib Shears	
Rotary Snowplough	Stem Cells	3-D Scanning
Russel Logging Boat	Surgical Curare	Igloo
Steam Buggy	Telesurgery	
Trolley Pole	Weevac	
Variable Pitch Propeller	Wound Diagnostics	
Vista Dome Car		
Weasel		

Communication	Computer	Cosmetology
56K Modem	Computerized Braille	Retail Cosmetics
BlackBerry	Great Sound	
Digital Telephone Switch	IMAX	
Java	Internet Search Engine	
Pager	Key Frame Animation	
Telephone	Multi-Touch Screens	
Two-Way Messaging		
Walkie Talkie		

General Technology		Construction
Avro Arrow	Orenda	No-Repair Bridges
Beartrap	Quick-Release Buckle	
Caulking Gun	Robertson Screw	
Holistic Aircraft	Rotary Car Dumper	
Hot and Cold Faucet	Roto Thresh Combine Harvester	
Hydrokinetic Turbine	Screw Link	
Inspection	Shrouded Tuyere	
Lubricating Cup	Snow blower	
Milk Carton 2.0	Spiral Nail	
Odometer		
Oil Can		

Name: _____   **Innovation :** _____

Innovation placemat organizer

INQUIRY
Why was this object or process innovated?

IMPLEMENTATION
What was needed to create or implement this innovation?

IDEATION
How was the idea developed for this innovation?

IMPACT
How did this innovation make a difference?

INCUBATION
What challenges do you think were encountered when this object or process was innovated?
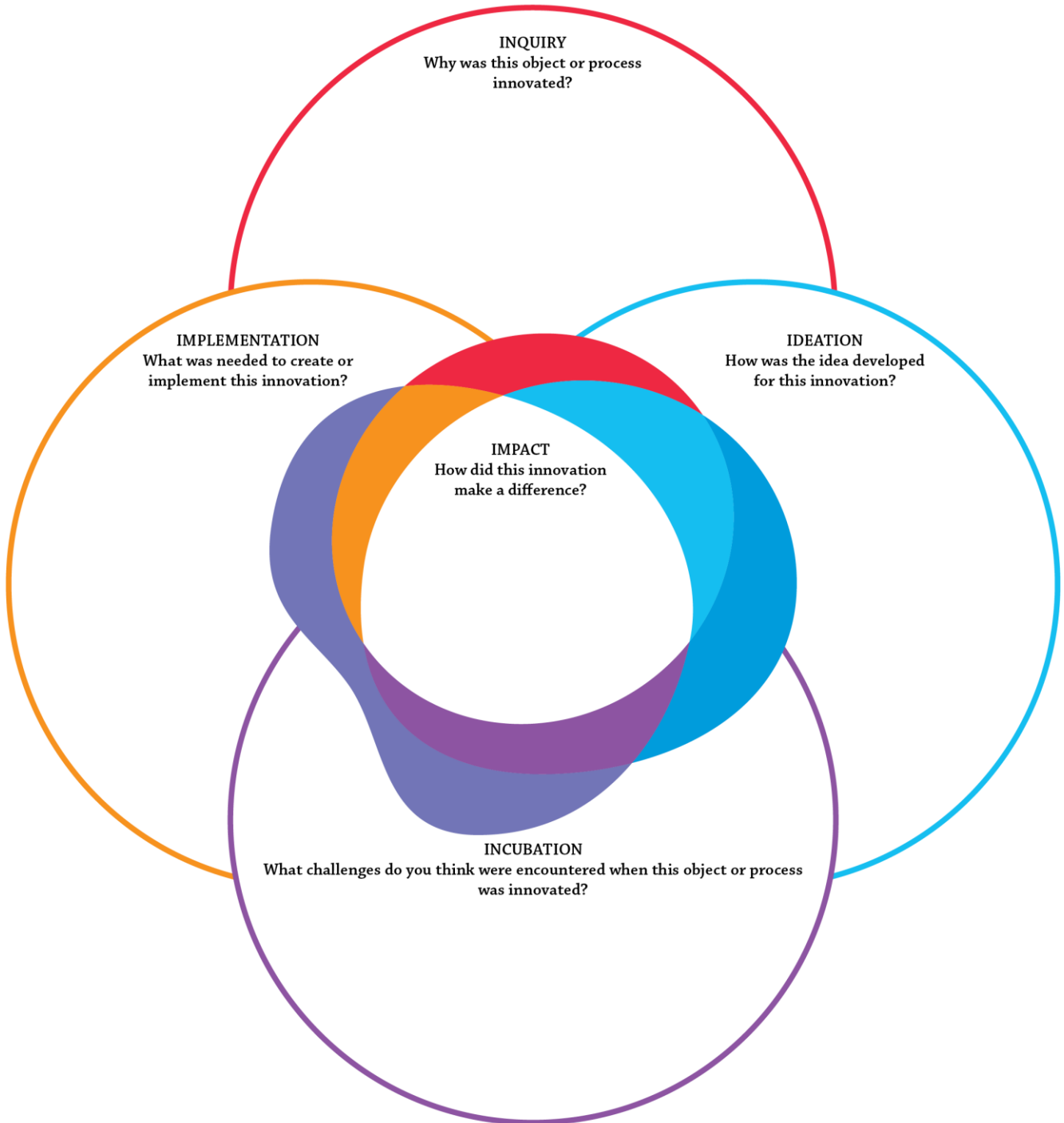
Name:

Exit Ticket

Three facts I learned:

1.

2.

3.

Two questions I have:

1.

2.

One opinion I now have:

Please describe one past innovation of interest.

Please describe one innovation that you might make in the future.

Reflecting on the Qualities of Canadian Innovators

Background
Canada has produced a range of prominent innovators in various fields such as arts, government, science, technology, business, health, sports, and social organizations. It is interesting for learners to reflect on the qualities of innovators such as persistence, collaboration, problem solving, initiative, caring, resilience, and strong work ethic through real-life examples of Canadian innovators. Learners will examine and research Canadian innovators and their biographies to learn more about innovator qualities. The activity involves developing Expert Groups who will then pass on their discoveries within Sharing Groups. Learners will also be given the opportunity to assess their own qualities both before and after they engage in developing an innovation.

Learning Goals
- Understand and examine the qualities of innovators (e.g., persistence, creativity, collaboration, resourcefulness) pertaining to corresponding disciplines.
- Research and explore innovator qualities through biographies of Canadian innovators.
- Self-reflect on personal qualities as related to innovators.

Resources
- *Ingenious* by David Johnston and Tom Jenkins
- Canadian Encyclopedia: https://goo.gl/uNQp1A
- Heritage Minute Videos: https://goo.gl/hb3nJ4
- Dictionary of Canadian Biography: https://goo.gl/15Sxic
- Innovation 150 Stories: https://goo.gl/iu4JGY
- Whiteboard with projector capabilities
- Technology device(s) with access to the Internet
- Chart of *Ingenious* innovators organized by discipline (Appendix 5A)
- Innovator Exploration Sheet (Appendix 5B)
- Innovator Self-Assessment (Appendix 5C)
- Sample Coding Lesson related to the Governor General Innovation Award recipients (Appendix 5D)
- Coding Lesson Solution Sheet (Appendix 5E)

Activating
- Write INNOVATOR in the middle of a whiteboard or anchor chart (to be used for future reference). Distribute Post-It Notes to learners. Have learners write down what personality traits or qualities an innovator might have. Learners will stick their Post- It Notes around the word INNOVATOR.
- Ask two or three volunteers to approach the whiteboard or anchor chart and sort the Post-It Notes into characteristics and qualities that can be grouped.
- Discuss groupings of common characteristics or qualities of innovators.
- Use the Heritages Minutes website to provide learners with stories of Canadian innovators. These videos will help activate an understanding amongst learners. Educators might use a video whose topic is course-specific. However, if a general video is desired, the innovation of the goalie mask by innovator Jacques Plante is suggested: https://goo.gl/idEPkj

- Provide learners with the opportunity to reflect on the video and contribute additional qualities that may be considered when envisioning an innovator. Learners may suggest qualities such as brave, ingenious, resilient, or persistent.

Acquiring and Applying

- Assign learners into research groupings (number of groupings should coincide with the number of innovations/corresponding innovators). For example, if there are six innovations, there will be six groups. Four to six groups are recommended.
- Assign an innovation pertaining to course content to each group (see Appendix 4A Chart of *Ingenious* Innovations Organized by Discipline, or 5A Chart of *Ingenious* Innovators Organized by Discipline). Using this innovation, each learner will complete the first page only of their own Innovator Exploration Sheet (Appendix 5B) by researching books, Internet sites, etc.
- Encourage learners to work collaboratively and remind them that at the end of the activity, each group member will be an expert on their respective innovator.
- Regroup the learners into Sharing Groups after the research is completed. The new groups will include one innovator expert from each previous group. Learners can now share their findings with their new groups to ensure that all learners have common understandings of the various innovations and innovators.
- Ask learners to independently select one of the other innovators who they would like to research further. Learners may wish to research current innovators who are presently making an impact with their innovations. The recipients of the Governor General Innovation Awards are excellent examples of current innovators. Using further research, learners will complete the second page of Appendix 5B.

Consolidation and Conclusion

- Ask the following questions in a group discussion:
  - What common traits did the Canadian innovators possess?
  - Did any traits surprise you? Explain.
  - How is facing failure with resilience a valuable trait when innovating?
- Request that learners complete an Innovator Self-Assessment (Appendix 5C). Ensure that the learner saves the assessment in a safe place (or educator may choose to collect them) for self-reflection after the Innovation Project is complete. Options for self-assessment: Set up a Google Form or Use Appendix 5C.
- Consider using the Coding Lesson (Appendix 5D) related to the Governor General Innovation Awards to consolidate learning about innovators and develop coding skills

Chart of *Ingenious* Innovators Organized by Discipline

Visual Arts	Drama	Media Arts
Developing Tank (Arthur McCurdy) Group of Seven Paint Roller (Norman Breakey)	Cirque Du Soleil (Guy Laliberté) Documentary Film (Robert Flaherty) Superstardom (Gladys Louise Smith) Yuk Yuk's (Mark Breslin)	Brownie Camera (Eastman Kodak) Commercial (Sir Clifford Sifton) Digital Photography (Willard Boyle) Instant Replay (George Retzlaff) Movie Theatre (Léo-Ernest Ouimet)
Music		
Gould's Musical Technology (Glenn Gould) Synthesizer (Hugh Le Caine)		
Business & Economics	**Geography**	**History**
Easy-Off (Herbert McCool) Loonie (Robert Ralph Carmichael) Me To We (Craig Kielburger and Marc Kielburger) Plexiglass (William Chalmers) Retail Cosmetics (Florence Nightingale Graham)	Blue-Box Recycling (Nyle Ludolph) Fish Ladder (Richard McFarlan) Inuit Arctic Research (Joey Angnatok) Plate Tectonics (John Tuzo Wilson) Standard Time (Sir Sandford Fleming)	Black Brant (Canadian Armament and Development Establishment, The Defense Research Board, and Bristol Aerospace) North-West Mounted Police (Sir John A. Macdonald) Pulp and Paper (Charles Fenerty) Straw-Gas Car (R.D. Maclaurin) Transcontinental Railroad (Sir William Cornelius Van Horne)
English	**Mathematics**	**Native Studies**
Enlightenment Short Story (Alice Ann Munro) Syndicated Journalism (Kit Coleman)	Interest Calculator (Carle Meilicke) Odometer (Samuel McKeen) Ships' Knees (New France Settlers)	Duck Decoy (Ojibway) Canoe (First Nations) Inuit Arctic Research (Inuit) Kayak (Inuktitut) Lacrosse (Indigenous Peoples) Red River Cart (Métis)

Law & Civics	Health	Physical Education
Declaration of Human Rights (John Humphrey) Homeless Hub (Stephen Gaetz) Restorative Justice (Mark Yantzi, Dave Worth, First Nations)	ACTAR 911 (Dianne Croteau) Herswab (Jessica Ching) HIV Cocktail (Bernard Belleau) Insulin (Sir Frederick Banting, Charles Best, and J. J. R. Macleod) Sulcabrush (Max Florence)	Goalie Mask (Joseph Jacques Omer Plante) Five-Pin Bowling (Thomas F. Ryan) Laser Dinghy (Bruce Kirby and Ian Bruce) Mulligan (David Mulligan) Pealess Whistle (Ron Foxcroft)

Physics	Chemistry	Biology
G-Suit (Wilbur Franks) Light Bulb (Henry Woodward and Mathew Evans) Neutrino Mass (Arthur McDonald)	Atomic Recoil (Harriet Brooks) Bomb Sniffer (Lorne Elias) Electron Microscope (James Hillier and Albert Prebus) Electron Transfer Theory (Rudolph Marcus) Liquid Helium (Gordon Shrum) Reverse Osmosis (Srinivasa Sourirajan and Sidney Loeb)	Cancer Bomb (Sylvia Fedoruk and Harold Johns) Hodgkin's Cure (Vera Peters) Insulin (Sir Frederick Banting, Charles Best, and J. J. R. Macleod) Pacemaker (John Hopps)
Earth & Space		
Stars in Globular Clusters (Helen Battles Sawyer Hogg) Zombie Stars (Victoria Kaspi)		

Sociology	Food & Nutrition	Family Studies
Me To We (Craig Kielburger and Marc Kielburger) Very Early Language Learning (Janet Werker)	Buckley's Mixture (William Buckley) McIntosh Apple (John Mcintosh) Nanaimo Bars (Edith Adam) Peanut Butter (Marcellus Gilmore Edson)	Pablum (Alan Brown, Fred Tisdall, and Theo Drake) Wringer Washer (John Turnbull)
		Fashion
		Wonderbra (Louise Poirier) Zipper (Gideon Sundback)

Transportation	Health Care	Manufacturing
Disappearing Propeller (Harold Wilson) Snowmobile (Joseph-Armand Bombardier) Trolley Pole (James J Wright)	Rib Shears (Norman Bethune) Montreal Procedure (Wilder Penfield) Surgical Curare (Harold Griffith) Microsurgical Staple Gun (George Klein)	Railway Air Conditioning (Henry Rutton) Self-Propelled Combine Harvester (Thomas Carroll) Variable Pitch Propeller (Wallace Turnbull) Weatherstrip (Joseph Therriault)
Technological Design		
3-D Scanning (Engineers from National Research Council) Igloo (Inuit)		

Communication	Computer	
BlackBerry (Mike Lazaridis) Telephone (Alexander Graham Bell) Walkie-Talkie (Donald Hings) Computerized Braille (Roland Galarneau)	Great Sound (Research Team at National Research Council) Internet Search Engine (Alan Emtage) Key Frame Animation (Nestir Burtnyk and Marceli Wein) Massive Open Online Course (Dave Cormier)	Oxford Online (Frank Tompa, Gaston Gonnet, and Tim Bray) Watfor (J. Wesley Graham and Peter Shantz) Multi-Touch Screens (Input Research Group at University Of Toronto) Panoramic Camera (John Connon)
General Technology	Cosmetology	Construction
Lubricating cup (Elijah McCoy) Robertson Screw (Peter Robertson) Screw link (Donald Munro) Spiral Nail (Allan Dove) Snowblower (Arthur Sicard)	Retail Cosmetics (Florence Nightingale Graham)	No-Repair Bridges (Canada's Critical Concrete Infrastructure)

Innovator Exploration Part A

Name of Innovator(s):

Name of Innovation:

Provide some background information on the Canadian Innovator.

INQUIRY: Why was the innovation developed?

IDEATION: How was the idea for the innovation created?

INCUBATION: What problem(s) did the innovator(s) face?

IMPLEMENTATION: How did the innovator(s) solve challenges and implement the innovation?

Innovator Exploration Part B

Name of Innovator(s):

Name of Innovation:

Describe how the Canadian Innovator(s) may have demonstrated some of the following qualities:

a) Persistence:

b) Collaboration:

c) Problem-Solving Skills:

d) Initiative:

e) Empathy and care:

f) Resilience:

g) Strong work ethic:

Name: Date:

Innovator Self-Assessment

Use the following rating scale to evaluate your own innovator qualities. Circle one of the numbers to describe <u>how frequently you demonstrate each quality</u>. Look back at your self-assessment throughout your innovation process to assess where you can improve and where you have improved! Rate: 1 (never), 2 (sometimes), 3 (often), 4 (always).

Quality	Self-Assessment 1 (Pre)				Self-Assessment 2 (Post)			
Persistence: I stay focused when innovating gets difficult.	1	2	3	4	1	2	3	4
Collaboration/Networking: I share tasks and responsibilities, and respectfully apply everyone's abilities.	1	2	3	4	1	2	3	4
Problem-Solving: When I encounter a problem, I assess the situation and generate possible solutions, and select one that seems most suited.	1	2	3	4	1	2	3	4
Initiative: I actively seek opportunities to use the innovation cycle.	1	2	3	4	1	2	3	4
Kindness: I think of others and assist my colleagues while offering suggestions and/or constructive criticism.	1	2	3	4	1	2	3	4
Resilience: When things don't work out the first time, I try again until it works, or I seek out new information to help make it work.	1	2	3	4	1	2	3	4
Strong Work Ethic: I work diligently during all stages of the innovation cycle.	1	2	3	4	1	2	3	4
Risk Taking: I am not afraid to step out of my comfort zone, and use lessons from failure while innovating.	1	2	3	4	1	2	3	4

Innovation Website Coding Lesson
Overview
Cross-curricular applications - Approximately 60-75 minutes

Students will learn about innovation in Canada, and create a website celebrating a Canadian innovation.

Invite students to research one of the following, their chosen recipient of the Governor General Innovation Awards or a Canadian innovation story from Ingenious by the Right Honorable David Johnston and Tom Jenkins or from wwww.Canadianinnovationspace.ca.

The Innovation Website Coding Lesson was developed in partnership with Canada Learning Code.

Learning Goals
- Use and apply innovative thinking skills
- Become aware of innovator stories and career options
- Explore and share information gathered through research
- Apply problem-solving and coding skills to create a website
- Use a website to share information with others
- Apply coding concept of sequence

Educator Preparation:
- Watch video on how to use Glitch: http://bit.ly/content101-videos
- Have learners create a GitHub account at: github.com →You won't be accessing GitHub directly, but you'll use this account to save your websites
- Review the example project: (click "Remix your own" to see inside): www.glitch.com/~innovation-website-example
- Print the Solution Sheet for the main activity: http://bit.ly/innovation-website-glitch
- Ensure computers and access to the internet for learners

Activating
- Ask: What does "innovation" mean? (Innovation is the creation or improvement of a product or process to make an impact.
- Ask: What makes an idea "innovative?" (A: Something that is new, original, creative or improved to make an impact)
- Watch and discuss this video about innovation in Canada: https://youtu.be/3J7hDsna0rc
- If you are writing about a GGIA Laureate ask: What is the Governor General Innovation Award? (An award that celebrates impactful innovation in Canada)
- If you are writing about a GGIA Laureate ask: Do you know of someone who has received this award? (See past recipients: https://innovation.gg.ca/year/current-year/)
- Review some of the past recipients and allow time for learners to peruse the website

Acquiring and Applying
- Ask learners to select one of the following:
  - Governor General's award recipient from: https://innovation.gg.ca/en/;
  - An innovation story from: www.CanadianInnovationSpace.ca;
  - Or, a Canadian innovation story from Ingenious
- Ask learners to find the following information:
  - Name of Canadian innovator
  - Their idea (in your own words)

- o What problem were they trying to solve?
- o How was their idea developed?
- o What challenges did they face?
- o How is their idea innovative?
- Remind learners not to forget to record references and/or sources of findings
- Inform learners that they will make a website about their chosen award recipient

Code Along
- Review the basic elements of a webpage, or watch the "HTML Basics" video together: http://bit.ly/html-basics-slides
- Show the code for the example project - Open ahead of time by clicking "Remix your own" (below the preview) - Don't let students see the actual website yet!
- Ask: Based on what we know about HTML tags, what do you think this website will look like?
- Either sketch the site up front based on their feedback or have pairs of learners sketch out the website
- Click on "Show Live" (top, left) to see how the website would be displayed.
- Check for understanding by asking learners to orally present or add their findings to a shared Google Doc.

Activity
- Have learners open the Starter Project (www.glitch.com/~innovation-website-starter) and click "Remix your own" under the website preview.
- Have them sign in (top right) using the class GitHub account that was created.
- Use the Solution Sheet to guide learners through the following steps:
  - o Remix the starter project
  - o Change the title of the site
  - o Change the heading
  - o Add some information
  - o Embed a video
  - o Add an image
  - o Change the styles
- Before learners share their website, have them add a section about themselves, reflecting on their role as a future innovator in Canada.
- What does innovation mean to you?
- What problems do you see in Canada that need help solving?
- How could you use your skills, strengths, or abilities to help solve these problems?

Consolidation and Conclusion
- Have learners share the link to their published project with the class (see solution sheet for steps).
- Plan time for learners to play eraseallkittens.com ("Play Demo")
- Add a more extensive research element. Have learners spend more time learning about their innovator or innovation organized by subtopics. Create a multi-page website by adding new html pages inside of the Thimble project, then linking the pages together using <a> tags.

Assessment
- Have learners use <!--Comments--> to explain their code
- Provide time for learners to present their websites to the class.
- Guide learners through editing and revising their work using the CUPS strategy (Capitalization, Usage, Punctuation, Spelling) - before submitting their final version

Terminology:

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

Webpage: A web page is a document or hypertext file connected to the World Wide Web that displays information using programming languages.

Hyperlink: A hyperlink or "link" is a link from a hypertext file to another location or file on the World Wide Web. Links are what make the Web great because they connect pages together so that we can find them.

HTML: Hypertext Markup Language (HTML) is a language used for tagging or "marking up" text files to achieve font, color, graphics, videos, and links on webpages.

CSS: Cascading Style Sheets (CSS) is the visual language used for presentation or styling of a document written in a markup language. CSS files are what make the web colourful, patterned, responsive, and cool

Tag: A tag is a piece of code that specifies how the document or piece of the document should be formatted. Tags have angled brackets, for example <h1> is the top most heading on a webpage.

Coding Innovation Lesson was developed in partnership with Kassandra Lenters of Canada Learning Code.

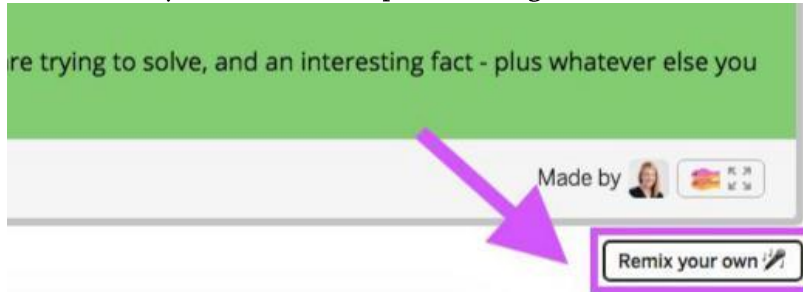## References

Governor General's Innovation Awards: https://innovation.gg.ca

Canadian Innovation Space: www.CanadiaaInnovatonSpace.ca

Ingenious: How Canadian Innovators Made the World Smaller, Smarter, Kinder, Safer, Healthier, Wealthier and Happier by The Right Honorable David Johnston, 28th Governor General of Canada and Tom Jenkins
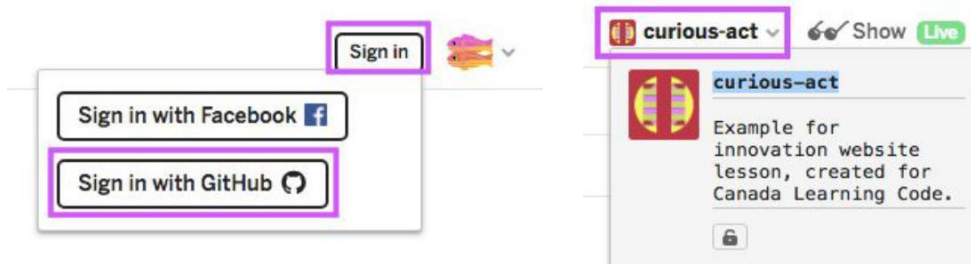
Innovation Website

Step 1: Remix the Starter Project
  1. Open the starter project: www.glitch.com/~innovation-website-starter
  2. Click "Remix your own" (under preview image)

re trying to solve, and an interesting fact - plus whatever else you

Made by

Remix your own

  3. Sign in using your class GitHub
  4. Change the project name (top left)

Sign in

Sign in with Facebook

Sign in with GitHub

curious-act

Show Live

curious-act

Example for innovation website lesson, created for Canada Learning Code.

*More advanced learners can follow along the tutorial at www.innovation-website-starter.glitch.me/tutorial.html

Step 2: Change the title of the site
  1. Open the index.html to get started. This is your home page.

assets
.env
README.md
index.html
style.css
tutorial.html
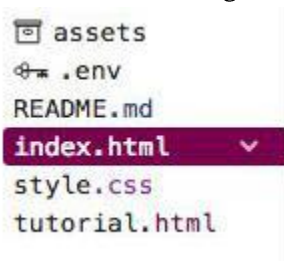
  2. Find the **<title>** element on line 6
  3. Change the title from "Innovation Website" to include your chosen topic

Show Live

  4. Preview your website by clicking on "Show Live" (top)
  5. You'll notice that this doesn't change anything on the website (visually). That's because this is a 'behind-the-scenes' name that is used when users search for your site or bookmark/save it in their browser.

6 ˅   <title>Innovation Website</title>

Step 3: Change the heading
1. The title that we actually see on the page is called a Heading. Find the <h1> tag on line 10
2. Replace the text with your chosen innovator or invention


```
10 ˅     <h1>Name of Innovator</h1>
```

Step 4: Add some information
1. Find the paragraph <p> on line 15
2. Update it with information about your innovator or invention
3. Add more paragraphs using the <p> </p> tags


```
15 ˅     <p>Information about their invention    </p>
```

Step 5: Embed a video
1. First, we need to find a video. Use a featured video from the Governor General website (https://innovation.gg.ca/en/) or head to www.youtube.com to search for a video that relates to your topic
2. Once you've found the video you want to embed in your site. Click the share button (it looks like a little arrow with share beside it) and choose embed
3. Copy the embed code
4. Go back to your project. Delete the other <iframe>code on line 11 to get rid of the example video
5. Paste the code you just copied into line 11


```
11 ˅     <iframe width="560" height="315" src="https://www.youtube
```

Step 6: Add an image
1. Go to Google Images and search for an image relating to your topic. Find a creative commons image by selecting Tools > Usage rights > Labeled for reuse.
2. Save the image to your computer (right click + Save image as)
3. In Glitch, go to the "assets" tab and upload the file from your computer

4. Click on the image, then "copy url" so we can add it to our webpage
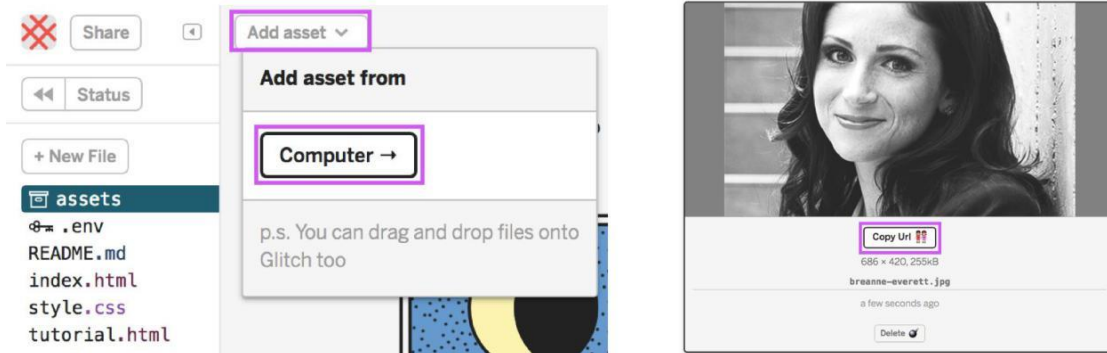
5. Back in the "index.html" create a new image tag (see below)

```
16    <img src="https://cdn.glitch.com/e72"/>
```

6. Add an alt attribute describing the image to make your website accessible to people using screen readers or similar technologies

```
16    <img alt="Image of Breanne Everett" />
```

*More info on images here: w3schools.com/tags/tag_img.asp

Step 7: Change the styles

1. The CSS file is where the styles for the website are kept. Open the style.css tab to see the existing styles. What do you see?

```
assets
.env
README.md
index.html
style.css          ⌄
tutorial.html
```
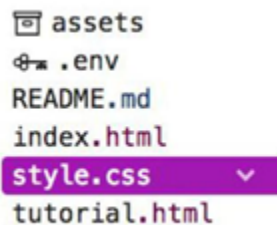
2. Try to change the background colour on line 3. What words or numbers work?

```css
1⌄  body {
2      font-family: "Open Sans", sans-serif;
3      background-color: blue;
4  }
5⌄  h1 {
6      color: #ffffff;
7      font-size: 48px;
8  }
9
10⌄ /*This is a comment. For more style ideas, check out: css.cool */
```

3. Let's add some more styles! Have learners go to www.css.cool to see some more options
4. Show learners how to click on a style on www.css.cool (which automatically copies the code for us!) then paste the code into style.css using CTRL+V

5. Add style to a NEW element by typing the tag name, then pasting the styles inside of curvy brackets (just like the examples already in there)
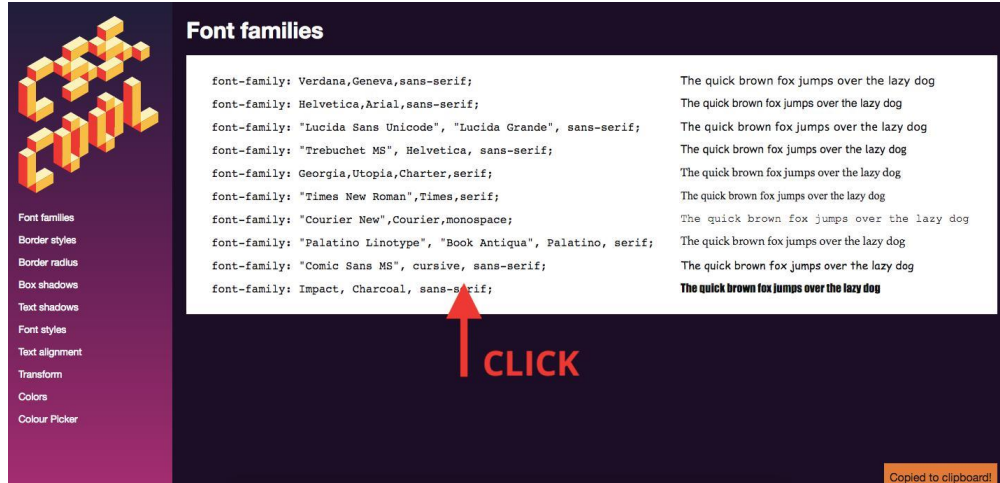
Step 8: Finished? Share your website!
1. Remind learners to rename their project (top left) with their first names. Have them check with a partner to make sure they both renamed their projects.
2. The link to their website is the same as the preview link ("show live")
3. Have them copy the URL and share it with you online (Twitter, Google Classroom, etc.).
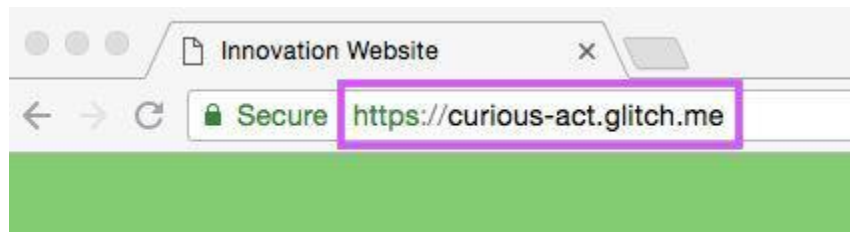
Developing an Innovation Proposal and Project

Background

The culmination of the learning experiences is the development of an innovation which ideally:

- Is the creation or the improvement of a product or process;
- Engages learners in working through all phases of the Innovation Cycle;
- Is a cross-curricular assignment to be completed by a small group of learners with a common interest;
- Incorporates an interdisciplinary approach including literacy and mathematics.

The development of an innovation involves a Innovation Team of learners completing an Innovation Proposal for an Innovation Project.

The Innovation Proposal includes:

- Rationale and research data to support the innovation concept
- The design and purpose of the innovation concept
- A model or prototype for the innovation
- Plans for testing, experimentation and improvements
- Feedback from the testing and improving phase
- Extensive detail for elements of implementation
- Evidence of proposed impact and measures of success

The Innovation Project is:

- An extension and enhancement of the Innovation Proposal
- Includes the final design of the innovation
- The basis for a presentation at an Innovation Celebration

The Innovation Portfolio is:

- A virtual or physical collection of materials, documents, models and assessments related to the Innovation Proposal and Innovation Project
- A means of providing learners with assessment tools including the expectations for the Innovation Proposal and Innovation Project
- An assessment tool for educators to continually review the progress of the Innovation Team

Some educators may wish to refer to the Innovation Proposal as an Innovation Project, depending on the interests and needs of specific courses and disciplines. An Innovation Project may be a more tangible and concrete assignment appropriate for a product innovation. It is important that the process of developing an innovation reflects similar structures used in government, business and society. Thus, the initial step of developing an Innovation Proposal is an important first stage for the launch of an Innovation Project.

Learning Goals
- Use research skills to learn about Canadian Innovations and their impacts to provide inspiration.
- Use critical thinking skills to brainstorm possible innovations.
- Become familiar with the criteria of the Innovation Proposal.
- Apply knowledge to determine the intended impact of the proposed innovation.
- Understand the steps and roles involved in completing the Innovation Proposal and Project.
- Create a plan for developing, testing and implementing the proposed innovation.

Resources
- *Ingenious* by David Johnston and Tom Jenkins
- Artifacts or images of Canadian innovations
- Video: How Do Innovators Innovate? www.https://canadianinnovationspace.ca/
- Canadian Inventor Tests Out His Omni Hoverboard prototype: https://goo.gl/kt6HCg
- Innovation Proposal Templates:
- Innovation Proposal Outline (Appendix 6A)
- Innovation Proposal Checklist (Appendix 6B1 & Appendix 6B2)
- Innovation Proposal Brainstorming Sheet (Appendix 6C)
- Innovation Proposal Template: Sample 1 (Appendix 6D)
- Innovation Project Template: Sample 2 (Appendix 6E)
- Innovation Incubation Data Collection Templates:
- Innovation Testing Template (Appendix 6F)
- Sample Interview Questions (Appendix 6G)
- Sample Survey Questions (Appendix 6H)
- Innovation Assessment Tools:
  - Innovation Proposal Rubric (Appendix 6I)
  - Innovation Team Conversation Assessment Tool (Appendix 6J)
  - Innovation Testing Assessment Tool (Appendix 6K & Appendix 6K2)
  - Innovation Proposal Assessment Tool (Appendix 6L)

Introducing the Innovation Proposal

Ask learners to recall and describe innovations that they have researched in Parts 4 and 5 (possibly from *Ingenious*). Discuss how those innovations may have been developed and implemented.

- Discuss possible innovations developed in past grades/classes/workshops.
- Discuss whether those innovations created something new or improved.
- Reflect on the planning required for innovations and if they may have required a proposal or implementation plan.
- Determine the steps involved in completing an innovation project.
- Explore how innovations were launched and shared with others.
- Introduce the assignment of developing an innovation and corresponding Innovation Proposal. This proposal will be completed over a series of work periods and with a range of learning experiences.
- Review Appendix 6A to provide direction and parameters for the development of the Innovation Proposal.
- Form small groups of learners to work on developing a new innovation or improving an existing innovation. The Innovation Teams can be based on common interests or complementary skill sets.

- Guide each Innovation Team to work through the Phases of the Innovation Cycle to develop a product or process that will address their identified impact. The Innovation Proposal will include a detailed description of the innovation and the plans for implementation.

Inquiry: Reviewing the Innovation Cycle and Researching Canadian Innovations

- If not already shown, view the video: How do Innovators Innovate? on https://canadianinnovationspace.ca/resources/what-exactly-is-innovation
- Refer back to previous learning experiences and review the phases of the Innovation Cycle with reflections about the elements of each phase.
- Review some of the innovations that learners researched in previous learning experiences. Ask learners to identify how the Innovation Proposal is a culmination of working through all the phases of innovation.
- Invite learners to provide examples of innovations they have researched and the processes used throughout the development.
- Engage learners in discussing and inquiring about an innovation that could be further improved for greater impact. Discuss how they might try to address an issue or problem that surfaced during their research. To determine an area of interest, learners can refer to previous activities, newspapers and online resources, such as innovation stories available at https://canadianinnovationspace.ca/category/stories/
- Provide learners with Appendix 6B, Sample 1 to remind them of the Innovation Cycle and the questions to be addressed in each phase. The checklist in Appendix 6C, Sample 2 provides a clear outline of the components of the Innovation Proposal.

Starting an Innovation Portfolio

Introduce and explain the Innovation Portfolio to learners. These portfolios will provide learners with a place to store their progressive artifacts, prototype designs, and innovation ideas.

- The Innovation Portfolio can be completed by each group or by individual learners. It can also be completed online with electronic versions of the templates. The portfolio should consist of a collection of activity sheets, artifacts, designs and graphic organizers in order to:
- Guide planning as learners move through the innovation process; and
- Encourage learners to develop lists of materials they might need to create their innovation prototype.
- Ensure that the Innovation Portfolio includes rubrics and assessments the learners will use throughout the Innovation Project. This will ensure that they are provided with clear expectations for the proposal and final project.

Ideation: Brainstorming for the Development of an Innovation

- Introduce the activity of brainstorming an innovation with an Innovation Team.
- Provide learners with the brainstorming template (Appendix 6C) either on paper or electronically. Give learners time to brainstorm an innovation idea independently, providing them an opportunity to formulate their own ideas. Innovation Teams will then have time to share these ideas for greater integration and cross-pollination.
- Remind learners that, along with previous research on needs and issues, the intended impact goal of the innovation should guide the design of the innovation concept.

Organizing for Innovation Proposals

- Present either the Innovation Proposal Template: Sample 1 (Appendix 6D) or Innovation Proposal Template: Sample 2 (Appendix 6E). These templates will guide the development of the Innovation Proposal. Educators may decide which template they wish to use with their learners. Templates may also be adjusted as deemed appropriate.
- Ask learners to determine their roles in the development of the Innovation Proposal. All learners should work on the design, but based on the brainstorming sheet, some learners may wish to assume a leadership role in the functional areas of: Marketing, Finance, Community Outreach and Production/Operations. In addition, the Innovation Team may decide that one member take on the role of Project Manager to ensure that all the parts of the Innovation Proposal are addressed with continuity and consistency.
- Invite learners to present their initial brainstorming ideas and the impact they wish to make with their concept as recorded on Appendix 6C.
- Remind Innovation Teams that they are to ultimately develop an Innovation Proposal with details as outlined on the sample templates provided. (Appendices 6D and 6E).
- Ensure that each Innovation Team has developed a sound concept with a clear description of the proposed innovation. In some cases, a physical prototype of the innovation may be created in order to test and improve it in the Incubation Phase. When the proposed innovation is a concept (such as a social innovation), feedback should be collected from potential users or participants.

Incubation: Testing and Improving the Innovation

In our society, Innovation Incubators are places for testing, improving and growing start-up innovations. Learners should be encouraged to use the Incubation Phase in a similar way: seek feedback from peers, mentors and experts, and use experiments as appropriate to collect data. The feedback can be used to make improved versions or iterations of the innovation. Both qualitative and quantitative data can be collected with various methodologies and analyses to inform the Innovation Team's decisions regarding perceived effectiveness and impact. Learners continue to inquire during this phase, as they gain understandings about the impediments and challenges they will face in the Implementation Phase.

Learners can watch the video: Canadian Inventor Tests Out His Omni Hoverboard and contemplate the question: Why is it important to test innovations?

Appendices 6F, 6G, and 6H are sample templates for the collection of data from experiments and surveys. Appendix 6K is the sample assessment tool to evaluate the Innovation Team's efforts to experiment with the proposed innovation.

Strategies for collecting data include the following:
- Interviewing potential users about the proposed innovation to get perspectives on effectiveness, cost and target audience.
- Experimenting with the proposed innovation prototype to assess its effectiveness under varied conditions and with a range of participants.
- Meeting with mentors and subject experts to get their perspectives on the proposed innovation.

Suggested prompts for educators

- Discuss the importance of testing a product or process before it goes to market. In this step, learners develop an awareness of innovation plans continually needing improvement, and that trial and error is part of the innovation process. The Innovation Teams will need to conduct appropriate testing and record their results to develop a plan to make improvements to their innovation. Learners can be reminded that innovating is an iterative process with constant revisiting and revising of concepts and plans.
- Brainstorm ways of testing innovations (record responses on chart paper or whiteboard for learners to reference).
- Request that learners decide on the types of testing they will do for their innovation. Ask learners to determine what kind of data they will collect and the data collection method.
- Allow learners time to develop a survey or interview questions tailored to their needs based on the samples provided. The survey or interviews could be electronic or in person. Learners may wish to interview school personnel, community partners, parents, or siblings depending on the purpose and audience of their innovation.
- Poll learners to determine what programs they are familiar with (Excel, Google Sheets, etc.) for collecting and summarizing the data.
- Instruct learners to submit a summary of data collection, findings and recommendations using the Innovation Testing Template (Appendix 6F).
- Encourage learners to indicate the changes, improvements, or iterations they will make to their innovation.

Implementation: Plans for Implementing the Innovation

An idea becomes an innovation when it is implemented and makes an impact. Therefore, it is important for innovators to make detailed plans for implementation. The Innovation Proposal Templates in Appendices 6D and 6E provide educators and learners with options for completing the Innovation Proposal assignment. The Innovation Proposal can be organized according to the Innovation Cycle Phases (Appendix 6D) or like a Business Plan (Appendix 6E). In either case, the Innovation Team needs to describe the proposed innovation concept, provide rationale and supporting evidence, describe or build a prototype or model, report on testing and feedback, and outline detailed implementation plans for costs, marketing, distribution, and sustainability.

Depending on the expectations of the course(s) related to the Innovation Proposal assignment, educators may:

- Provide Innovation Teams with access to the Innovation Space and related resources to develop and describe the proposed innovation.
- Encourage Innovation Teams to research potential innovations by studying previous innovations and qualities of innovators.
- Require that Innovation Teams build prototypes of the proposed innovation or describe the model in detail.
- Support Innovation Teams to use literacy, mathematics, arts and other subject area skills to outline the details of the proposal (data analyses, costs, marketing and operations). Some Innovation Proposals may include detailed budgets and marketing approaches such as commercial videos or artistic posters.

Assessment Strategies and Tools

Educators are encouraged to hold learner-educator conferences to meet with Innovation Teams to assess progress. Educators can choose to assess individual contributions or use team evaluations to encourage collaboration and peer-assessment. The sample assessments can be adapted to fit the needs of each learning environment or preferred conference style.

Educators may customize the sample assessments and create new tools to best reflect course Learning Goals and expectations.

Strategies
- Innovation Proposal Outline (Appendix 6A)
- Innovation Proposal Checklist (Appendix 6B - Samples 1 and 2)
- Innovation Proposal Brainstorming Sheet (Appendix 6C)
- Innovation Proposal Template: Sample 1 (Appendix 6D)
- Innovation Project Template: Sample 2 (Appendix 6E)
- Innovation Testing Template (Appendix 6F)
- Sample Interview Questions (Appendix 6G)
- Sample Survey Questions (Appendix 6H)

Tools
- Innovation Proposal Rubric (Appendix 6I)
- Innovation Team Conversation Assessment Tool (Appendix 6J)
- Innovation Testing Assessment Tool (Appendix 6K)
- Innovation Proposal Assessment Tool (Appendix 6L)

The Innovation Proposal

Message to Canadian Youth,

Canadian innovators have been making the world smarter, smaller, kinder, safer, healthier, wealthier, and happier through their creative innovations! You have been learning about some interesting Canadian innovations that have made a significant impact on the world. You and your peers will now form an Innovation Team to develop an innovation that you collaboratively decide is necessary and can make a difference or impact on our world. The Innovation Proposal is an assignment to describe your proposed innovation.

Innovating is challenging, but it is also an exciting process including research, inquiry, design, creation, testing, improvement, and implementation. Your Innovation Team will use data and research information to design an innovation that you believe is needed and significant. The impact your innovation will make on the world will determine its concept and design. Your team will continually consider whether the innovation will reach your intended impact goal.

By working through a series of activities, your Innovation Team will develop an innovation using your knowledge of the Innovation Cycle and based on prior learning. Together, you will inquire about past innovations or current problems, develop an idea into an innovation, incubate and test the innovation and make plans to implement it.

As you work through each phase to develop your innovation, you will organize your own Innovation Portfolio, which includes materials related to the process of innovation. The Innovation Portfolio can be a physical or electronic collection of resources, designs, templates and artifacts.
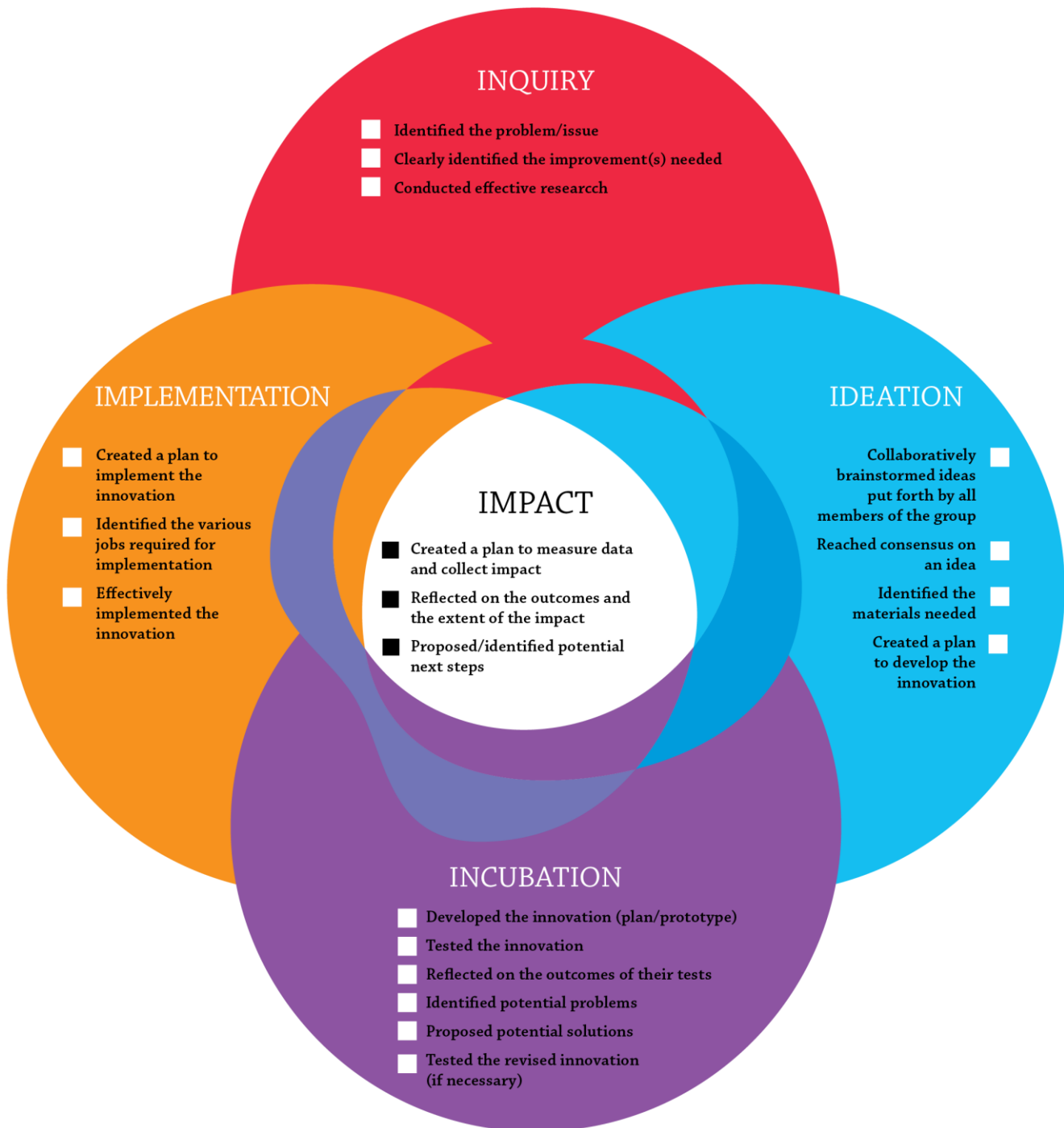
Each Innovation Team will work together to complete all sections of the Innovation Proposal. The Innovation Proposal requires significant detail for each component; various templates and forms are provided to guide your work. Innovation Team members may take on various roles related to: design, budget, resources, marketing and project management.

Please keep all samples of work in your Innovation Portfolio and complete the Innovation Proposal in detail. Proposals will be shared with other Innovation Teams.

Good luck and happy innovating!

Name of Innovation:

Innovation Team Members

INQUIRY

- Identified the problem/issue
- Clearly identified the improvement(s) needed
- Conducted effective researcch

IMPLEMENTATION

- Created a plan to implement the innovation
- Identified the various jobs required for implementation
- Effectively implemented the innovation

IMPACT

- Created a plan to measure data and collect impact
- Reflected on the outcomes and the extent of the impact
- Proposed/identified potential next steps

IDEATION

- Collaboratively brainstormed ideas put forth by all members of the group
- Reached consensus on an idea
- Identified the materials needed
- Created a plan to develop the innovation

INCUBATION

- Developed the innovation (plan/prototype)
- Tested the innovation
- Reflected on the outcomes of their tests
- Identified potential problems
- Proposed potential solutions
- Tested the revised innovation (if necessary)

Innovation Proposal Checklist

Name of Innovation: _____

Innovation Team Members: _____

Component	The Group has:
INQUIRE	❏ Conducted effective research on related innovations ❏ Conducted effective research on related innovators ❏ Identified problems or issues to be addressed
IDEATE	❏ Collaboratively brainstormed ideas with Innovation Team ❏ Reached consensus on an idea for the innovation ❏ Identified the materials or resources needed ❏ Created a plan to develop the innovation prototype
INCUBATE	❏ Created a plan/methodology to collect test data ❏ Tested the innovation and gathered feedback ❏ Identified potential problems and solutions ❏ Proposed and tested new iterations
IMPLEMENT	❏ Planned including name of innovation, budget, marketing, costs, materials, and distribution ❏ Identified the various jobs/roles required for implementation
IMPACT	❏ Determined the intended impact of the innovation ❏ Developed measures to assess the impact ❏ Reflected on the outcomes and the extent of the impact ❏ Identified potential next steps to meet intended impact

Innovation Proposal Brainstorming Sheet

Innovation Teams may use this template or other samples to collect ideas for each phase.

INQUIRE
What issue or problem do we want
to address? OR What do we want to
improve?

IMPLEMENT
What is the budget for the
innovation?
How will the innovation
be communicated
or sold
to others?

IDEATE
What ideas do we have?
What materials/resources
will we need? What is the
title of our innovation?

IMPACT
What difference will our
innovation make?

INCUBATE
How will we test the innovation?
What problems do we need to address?

Innovation Proposal Questionnaire

Use the following questions to describe and expand on your Innovation Proposal.

INQUIRE: Research and rationale for your proposed innovation

1. What is the background to your proposed innovation?
2. What are some interesting facts about a past innovation that is related to your proposed innovation?
3. What was the process that was used to develop a related innovation?
4. Why do you think your proposed innovation is important?
5. What is the research that substantiates the need for the proposed innovation?
6. What potential impact could this proposed innovation make?

IDEATE: Concept of the proposed innovation

1. What is the idea for your innovation? Is it a product or process?
2. What is the title for your proposed innovation?
3. Can you make a model or design?
4. How will you make or create the innovation?
5. What do you need to create this innovation?
6. Is your proposed innovation an improvement of past innovations?
7. How will this innovation make an impact?

INCUBATE: Testing, experimenting and growing the innovation

1. How will you test your innovation?
2. What problems did you have when you tested your innovation?
3. What did your peers or others think about your innovation?
4. Does the innovation have the impact that you wanted?
5. Think about both the feedback and data collected from innovation tests. How can you improve your innovation to make it better?
6. If necessary, redesign your improved innovation. Add some details explaining the improvements that your group is going to make.

IMPLEMENT: Launching the innovation into action

1. What are the roles to be assumed within your Innovation Team (designer, accountant, project manager, marketing person, and others)?
2. How much will your innovation cost to produce? Where will resources and materials be obtained? Do you require support from grants or investors?
3. What is your plan for launching the innovation to potential clients/customers?
4. How will you make sure that the innovation idea or intellectual property is protected for your Innovation Team?
5. Does your innovation need to be incorporated?
6. After you launch your innovation, how will you know that it was successful? What are your measures of success of the intended impact

The Innovation Proposal

Innovation Title:

Team Members:

What is an Innovation Proposal?

An Innovation Proposal includes innovation goals and objectives, and describes what will be achieved over a specific period of time. The proposal should include:
- A description of the product or service that the innovation will provide.
- A prototype or model of the design.
- The rationale and supporting research for the proposed innovation.
- How the innovation will operate and where it will be located.
- The risks or challenges associated with the innovation based on testing feedback.
- The plan for managing challenges.
- The resources or supports needed for the innovation.
- The start-up costs, expenses, profits and expected impact.

Why develop an Innovation Proposal?
The Innovation Proposal allows innovators to think about the all elements of the proposed innovation, including the potential product(s), customers/end users and competitors, marketing and financing. A proposal ensures that the innovation can be put into action.

Innovation Proposal Guideline
The Innovation Proposal should include the following components:

Section I: Summary of Innovation Inquiry and Research
- Why is this innovation necessary?
- What is the rationale for the proposed innovation?
- What innovations are similar to the proposed innovation?
- What will the innovation do?
- What is the intended purpose or impact?

Section II: Summary of Innovation Idea
- What is the product or service (title and description of the innovation)?
- What makes the product or service unique and appealing?
- What is the market or stakeholder group that you will service?
- Are there any advantages over competitors or other similar service providers?
- What are the materials and resources needed and who will be the supplier(s)?
- What are the innovative features of the product and/or service that make it unique?
- What features or advantages will entice customers to buy the product or clients to use the service?
- How will the proposed innovation meet a need or solve a problem to make an impact?
- Have you made a prototype or model of the proposed innovation?

Section III: Incubation Plan for Testing and Improving the Innovation
- What is the plan for assessing the effectiveness of the innovation?
- Will feedback be collected from potential users and participants?
- How will the innovation be tested and improved?
- How will improved versions of the innovation be developed?
- How will mentors and experts be consulted?
- How will impact be increased?

Section IV: Implementation Plan
- What are the roles to be assumed within the Innovation Team?
- How will the product/process be made? How will service be implemented?
- What are the processes and the costs?
- What are start-up costs, projected sales and profit?
- Where will the innovation be located, what are the potential start dates and the hours of operation (where appropriate)?
- How will success or impact be measured?

Customers/Clients
Who is the target market? Provide specific demographic factors such as age, gender, race, marital status, income, education and occupation.

Cost/Price
- What will be the cost of the product or service? How was this cost calculated?
- How is this money/support attained? Is the service funded as a social innovation?
- Take into consideration costs such as supplies, overhead, labour, rent, and other expenses. Remember to also consider what the competitors or similar providers charge.

Estimated Profits and Competition
- How many units of the product can be produced? How many times can the process be repeated?
- If the innovation is a service, how many jobs/clients can be booked each week?
- Who are your competitors?
- What opportunities and threats exist given the competitive landscape?

Marketing and Promotion of the Innovation
- How will the innovation be advertised or communicated (direct mail, Internet, radio, television etc.)?
- Describe plans to generate media attention for the innovation. What kinds of marketing materials will be used (brochures, business cards, posters, etc.)?
- Will a website be created? If so, describe how it will be used to market the innovation.
- What other forms of marketing will be used (tradeshow, telemarketing, cold calling, Instagram, Twitter, other social media)?
- What will this advertising and other promotion cost?

Section V: Budget and Financing
List in detail the budget that will be required to build, start and operate your innovation. Items may include:

- Cost of materials
- Advertising
- Licenses
- Business registration

- Bank charges
- Insurance
- Equipment
- Inventory

- Office supplies
- Potential employees

Using a computer spreadsheet, create income statements showing revenue and expense forecasts on a monthly basis for the first year of operations. Include three different forecasts: optimistic, realistic and pessimistic.

Identify start-up costs and indicate funding options to cover operations of the innovation. Funding options may include: savings, money borrowed from investors, bank loans, lines of credit, government grants and loans.

Note: Innovation Proposals may include a sample of the proposed innovation with a model or prototype provided by the Innovation Team. Samples of testing or experimentation feedback will enhance the proposal. Lastly, sample commercials or advertising posters can also be included to provide a more comprehensive proposal. Innovation Teams are invited to expand the Innovation Proposal guidelines.

Innovation Testing

Use the provided questions to conduct a test/experiment of your team's innovation. Record the results in the format of your choice. Consider future improvements that could be made.

Name of Innovation:

Research Focus and Questions

- Define why the test is necessary.
- Define the issues that the innovation addresses.
- Identify and communicate the research questions.

Creating a Plan for Testing

- Identify materials and resources necessary for the test.
- Identify the participants in the test.
- Outline a method to conduct the test.

Collecting Data

- Create appropriate strategies for collecting data.
- Identify who will participate in the collection of data.
- Apply appropriate methods for data collection and analysis.
- Report findings to inform the outcomes of the testing.
- Reflect on the quality of the data collected; propose improvements and/or modifications to the testing.

Interpretations of Results and Conclusions

- Use data to inform the outcomes of the testing, to answer the question and/or address the problem/issue.
- Use testing outcomes to further improve the Innovation Proposal.
- Develop further investigations and research strategies as a result of outcomes.
- Create detailed plans for implementation.

Interview Questions

Use the interview questions to collect feedback about your innovation. Apply the results to improve your innovation. Ask potential users of your innovation the following questions:

1. What are some positive features of the innovation?

_____

_____

_____

_____

2. What are some negative features or potential drawbacks of this innovation?

_____

_____

_____

_____

3. How could this innovation be useful in the world and make a positive impact?

_____

_____

_____

_____

4. How will this innovation make a negative impact?

_____

_____

_____

_____

5. How could this innovation be improved?

_____

_____

_____

_____

5. Would you purchase or use this innovation? Why or why not?

_____

_____

_____

_____

Innovation Survey Questions

Use the provided survey questions to collect feedback about your innovation. Apply the results to the improvement of your innovation. Ask participants the following questions:

1. Are you familiar with a similar innovation? If yes, please specify.

_____

_____

2. Will this innovation be impactful? If no, please specify why not.

_____

_____

3. Will this innovation be well-received? If no, please specify why not.

_____

_____

Rating Scale: 1 (poor), 2 (satisfactory), 3 (good), 4 (very good), 5 (excellent)

This innovation is creative and collaborative.	1	2	3	4	5
This innovation will improve people's lives.	1	2	3	4	5
This innovation is realistic.	1	2	3	4	5
This innovation addresses a real-world issue.	1	2	3	4	5
This innovation has the potential for further progress.	1	2	3	4	5
This innovation will be successful.	1	2	3	4	5

Comments:

_____

_____

_____

_____

_____

Innovation Proposal Rubric

Innovators: _____ **Innovation:** _____

	Level 1	**Level 2**	**Level 3**	**Level 4**
Knowledge & Understanding The innovation was created using knowledge acquired from research and inquiry about issues and past innovations.	Learners demonstrated limited knowledge based on little prior inquiry to develop an innovation that does not meet identified need.	Learners demonstrated some degree of knowledge based on minimal prior inquiry to develop an innovation that minimally meets identified need.	Learners demonstrated a considerable degree of knowledge based on prior inquiry to develop an innovation based on identified need.	Learners demonstrated a high degree of knowledge based on inquiry to develop an innovation that met an identified need and desired impact.
Thinking Learners demonstrated planning, critical and creative thinking and problem-solving skills throughout the development of their innovation.	Learners demonstrated limited planning, creative/ critical thinking and problem-solving skills in the development of their innovation.	Learners demonstrated some planning, creative/critical thinking and problem-solving skills in the development of their innovation.	Learners demonstrated considerable planning, creative/critical thinking and problem-solving skills in the development of their innovation.	Learners demonstrated a high degree of planning, creative/critical thinking and problem-solving skills in the development of their innovation.
Communication The innovation was presented clearly, persuasively and effectively for different audiences and purposes.	The learners presented their innovation with limited clarity, persuasion and effectiveness for different audiences and purposes.	The learners presented their innovation with some clarity, persuasion and effectiveness for different audiences and purposes.	The learners presented their innovation with considerable clarity, persuasion and effectiveness for different audiences and purposes.	The learners presented their innovation with a high degree of clarity, persuasion and effectiveness for different audiences and purposes.
Application Learners applied their knowledge and skills of the Innovation Cycle to their innovation proposal.	Learners applied limited knowledge and skills of the Innovation Cycle to their innovation.	Learners applied some knowledge and skills of the Innovation Cycle to their innovation.	Learners applied considerable knowledge and skills of the Innovation Cycle to their innovation.	Learners applied a high degree of knowledge and skills of the Innovation Cycle to their innovation.

Innovation Team Conversation Assessment

Document your discussions during the development of the Innovation Proposals. Include these in your Innovation Portfolios.

Intended Learning:
❑ _____ ❑ _____ ❑ _____ ❑ _____
Questions to Ask:
❑ _____ ❑ _____ ❑ _____ ❑ _____

Look for…	Comments:
Communication: ❑ Clearly communicates ideas. ❑ Expresses and organizes data and information. ❑ Uses proper vocabulary in communications. ❑ Writing style was appropriate to the context.	
Thinking and Inquiry: ❑ Understands the process through which the learning occurred. ❑ Develops a clear plan to initiate inquiry. ❑ Describes the connection between the process and the development of the innovation to address impact. ❑ Reflects on the goals and results of the learning. ❑ Makes connections between outcomes and the learning. ❑ Proposes reasons for the outcomes of the learning. ❑ Analyzes the outcomes and critically reviews the process to make improvements.	

Look for...	Comments:
Application: ❏ Demonstrates an ability to apply concepts learned to develop solutions. ❏ Uses concepts learned in creative ways to develop innovative solutions. ❏ Makes connections to past learning and continues to apply concepts to present tasks/problems. ❏ Makes connections to real-world application (society and the environment). ❏ Considers expanding what has been learned into new contexts.	
Knowledge and Understanding: ❏ Accurately states concepts learned. ❏ Demonstrates understanding of the concepts learned. ❏ Is familiar with innovation processes and subject-specific knowledge.	
Additional Conversations and Notes in Collaboration with Learners	

Next Steps	Comments:

Signatures:

Innovation Testing Assessment Tool

This checklist may be used for assessment of the Incubation Phase of the Innovation Proposal.

Name: _____

Team Members: _____

Component	The Team has:
Research Focus and Questions	❏ Defined why the test is necessary. ❏ Defined the issue(s) the innovation addresses. ❏ Identified and communicated research questions.
Creating a Plan for Testing	❏ Identified the materials and resources necessary for the test. ❏ Identified the participants in the test. ❏ Outlined a method for conducting the testing.
Collecting Data	❏ Created appropriate strategies for collecting data. ❏ Identified the participants involved in the collection of the data. ❏ Applied appropriate methods for data analysis. ❏ Represented and communicated data to inform outcomes of innovation testing. ❏ Reflected on the quality of the data collected and proposed improvements and/or modifications to the testing.
Interpretation of Results and Conclusions	❏ Made use of collected data to inform outcomes of innovation testing, addressing the research focus and questions. ❏ Suggested further improvements for the Innovation Project. ❏ Developed further investigations and/or research strategies to improve their innovation.

Innovation Testing Assessment Tool

This evaluation form may be used for assessment of the Incubation Phase of the Innovation Proposal.

Item	1 Needs Improvement	2 Satisfactory	3 Good	4 Excellent
Defining the question and/or problem and making a prediction/hypothesis Defines why the test is necessary. Defines the issues that the innovation addresses. Identifies and communicates research questions.	Comments:			
Creating a Plan for Testing Identifies the materials and resources necessary for the test. Identifies the participants in the test. Outlines a method to conduct the testing.	Comments:			
Collecting Data Creates appropriate strategies for collecting data. Identifies who will participate in the collection of data Applies appropriate methods for data analysis. Reports on data to inform the outcomes of the testing. Reflects on the quality of the data collected to propose improvements and/or modifications to the testing.	Comments:			
Interpretations of Results and Conclusions Uses data to inform the outcomes of the testing - answers the question and/or addresses the problem/issue. Uses outcomes to further improve the Innovation Proposal. Develops further investigations and/or research strategies; creates and executes plans for implementation.	Comments:			

Innovation Proposal Assessment Tool

Use this rating scale to determine if your Innovation Team has addressed each area of the Innovation Proposal.

Innovation Being Reviewed:

	1 Needs Improvement	2 Satisfactory	3 Good	4 Excellent
Summary of Innovation Idea Described the product or service of the innovation concept with background research and rationale.	Comments:			
Product/Service Testing Provided evidence of how the product or service was tested and improved.	Comments:			
Operation Plan Described how the innovation will operate or function, where it will be located and what geographic regions and users it will serve.	Comments:			
Marketing/Advertising Outlined the plans for communicating and marketing the innovation	Comments:			
Budget Addressed the start-up costs, projected sales, profit or impact. Outlined revenues and sources of financial support.	Comments:			

Sharing Innovations and the Innovation Celebration

The Innovation Proposals or Innovation Projects can be prepared and presented in a range of multimodal forms. Educators should encourage each Innovation Team to develop their own strategy for sharing the proposals or projects. Innovation Teams may be asked to submit their Innovation Proposals to the educator, or be asked to share their proposals or projects in creative ways for wider audiences.

Innovation Teams may have developed a prototype or model for their innovation, which has been tested and improved. Plans for implementation may include sample commercials and advertisements. The Innovation Portfolios, including artifacts reflecting the various phases of the innovation process, can form the basis of the presentation of the innovation. The plans, prototypes and portfolios can all be shared in a presentation by the Innovation Team.

Learners and educators may collaboratively determine appropriate and interesting ways to share and present innovations. Examples:
- Display Board
- Multimedia Presentation Video
- Written Proposal posted on Interactive Website
- Pitch to a panel of judges
- Social media sharing

An Innovation Sharing Checklist is provided in Appendix 7A to ensure that each aspect of the innovation is presented by the Innovation Teams. This checklist is a guide for presentations and can be adapted as deemed appropriate by participants.

Innovation Celebration

Canada's National Innovation Week is in the month of May and this time period can be used to highlight related activities such as Innovation Celebrations in schools and communities.

When a number of innovations are presented simultaneously to an audience, the concept could be termed an Innovation Celebration, either in a physical or virtual space. An Innovation Celebration should showcase what was learned by Innovation Teams and the processes they used through the phases of the Innovation Cycle.

An Innovation Celebration can be conducted in a variety of formats, and need not adhere to any particular format; these events can be designed and delivered by learner-innovators. Educators should encourage learners to innovate their own celebration. Samples of Innovation Celebrations are included on the website: https://canadianinnovationspace.ca/events/innovation-celebration/

Ideally, an Innovation Celebration is non-competitive and includes all learners who have participated in the initiative. The celebration can be held in a classroom, school gymnasium, community centre, or may be shared virtually. With input from learners and community partners, Innovation Celebrations can be organized school-wide or district-wide initiatives.

An Innovation Celebration can be:
- Organized for audiences involving schools and the community.

- Small celebrations (a single classroom, or a group of classes in a grade), or large celebrations (a division, a school, a group of schools or even a public event).
- Showcased virtually by making innovations accessible on a website such as https://canadianinnovationspace.ca/events/innovation-celebration

Innovation Teams may wish to determine the nature and purpose of the Innovation Celebration. They may decide if they want the event to be a celebration amongst each other, the school, the community, or the world. They could discuss whether it will be online, in the school or out in the community.

Collaboratively, learners and educators can begin to address these questions and determine the format of their celebration.

Appendix 7B can provide further guidelines for educators and learners planning Innovation Celebrations in their communities.

Resources

- Technology devices with access to presentation software
- Presentation supplies (trifold boards, art supplies, video cameras, green screens, etc.)
- Innovation Portfolios
- Innovation Sharing Checklist (Appendix 7A)
- Considerations for an Innovation Celebration (Appendix 7B)

Innovation Sharing Checklist

Use this checklist to help organize and design how Innovation Teams will share Innovation Proposals or Projects. Refer to your Innovation Portfolio and include important artifacts. Your challenge is to create a unique experience for your audience that showcases your Innovation Proposal or Project.

Group Members:

Innovation Title:

1. Introduce the innovation
❏ What is your innovation?
❏ What is it called?
❏ Does it have a logo or slogan?
❏ What issue, challenge or problem does it address?

2. How did your team develop this innovation?
❏ What ideas did your team consider?
❏ Why did your team decide on this design?
❏ What materials or resources did your team use to develop the innovation?
❏ Who was involved in the creation?

3. How did your team test and improve the innovation (if improvements were not necessary, justify why)?
❏ How did your team test the design?
❏ What were the challenges your team encountered?
❏ What steps did your team take to improve the innovation?

4. How will you share and market your innovation?
❏ How did your team plan to let the public know about the innovation?
❏ Who needs to support your team to implement this innovation (people, raw materials, economy, government, business, education)?

5. What is the planned impact of your innovation?
❏ How will the innovation help the world?
❏ Which aspect of society is it designed to help?
❏ Does your team think the innovation can be further improved in the future?
❏ If it can be improved, suggest possible improvements. If not, justify.

Considerations for Planning an Innovation Celebration

HOW: Plan
- Create a committee to help plan the celebration. Assign roles for logistical components such as: Facilities (set up, clean up, parking, participant and audience logistics, registration area, signs and promotional material), Outreach (getting the public involved), etc.
- Set up a schedule for showcase of Innovations.
- Organize learners and coordinate logistics for each innovation.
- Create Invitations, write introductions/greetings and thank-you cards.

WHO: Audience
- Connect with different local participants and partners
- Arrange media coverage of Innovation Celebration (photography, videography, virtual tours, connecting with school board and local media).
- Procure food and refreshments (if necessary).
- Ensure technical support (audiovisual equipment, etc.).
- Determine who will participate in the celebration (one class, many classes, how many innovations will be shared at the celebration).
- Determine who will view or visit the celebration.

WHAT: Focus and Materials
- Determine what the Innovation Teams will need in order to share their Innovations.
- Determine if there are community connections that will be celebrated and ensure that community partners are invited.
- Make sure the format of the Innovation Celebration reflects the variety of innovations. Ensure that Innovation Teams have an opportunity to modify and refine their work for the celebration.

WHERE: Location
- Determine where the celebration will take place (classroom, school gymnasium, library, community centre, Innovation Space, School Board).
- Determine technical and logistical needs such as electrical outlets, lighting for multimedia, sound, tables, and chairs, etc.

WHEN: Timing
- Determine the best time to accommodate the appropriate audience and select a time for the celebration to take place.
- Consider a virtual celebration in addition to the onsite celebration. For example, Innovations can be shared online at www.https://canadianinnovationspace.ca/ or virtual tours of the celebration can be made available through a virtual meeting platform such as Skype or Zoom.
  - NOTE: Ensure that proper permissions have been obtained from parents/guardians and learners before broadcasting virtual celebrations.
- Consider logistical constraints when determining the time and duration of the celebration, such as custodial staff, educational staff and community partners.

Resources & References

Print

Ingenious: How Canadian Innovators made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier and Happier (2017) by His Excellency Governor General David Johnston and Tom Jenkins

Innovation Nation: How Canadian Innovators made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier and Happier (2017) by His Excellency Governor General David Johnston and Tom Jenkins

Creating Innovators: The Making of Young People Who Will Change the World (2015) by Tony Wagner

Drive: The Surprising Truth About What Motivates Us (2011) by Daniel H. Pink

Empower: What Happens When Students Own Their Learning (2017) by John Spencer and A.J. Juliani

Inquiry and Innovation in the Classroom: Using 20% Time, Genius Hour, and PBL to Drive Student Success (2014) by A.J. Juliani

Invent to Learn: Making, Tinkering and Engineering in the Classroom (2013) by Sylvia Libow Martinez and Gary Stager

Launch: Using Design Thinking to Boost Creativity and Bring Out the Maker in Every Student (2016) by John Spence and A.J. Juliani

Pure Genius: Building a Culture of Innovation and Taking 20% Time to the Next Level (2014) by Don Wettrick

Shift This: How to Implement Gradual Changes for MASSIVE Impact in Your Classroom (2017) by Joy Kirr

Sparking Student Creativity: Practical Ways to Promote Innovative Thinking and Problem Solving (2014) by Patti Drapeau
The Genius Hour Guidebook: Fostering, Passion, Wonder, and Inquiry in the Classroom (2015) by Denise Krebs, Gallit Zvi (this has lessons)

The Idea of Canada: Letters to a Nation (2016) by David Johnston

The Innovator's Mindset (2015) by George Couros

The 20Time Project: How educators can launch Google's formula for future-ready innovation (2015) by Kevin Brookhouser

Your Start Guide to Makerspaces (2016) by Nicholas Provenzano

Value Proposition Design: How to Create Products and Services by [Alexander Osterwalder](), [Yves Pigneur](), [Gregory Bernarda]()

References

Pullan, M., & Langworthy, M. (2014). *A Rich Seam: How new pedagogies find deep learning.* London, UK: Pearson.

Ontario Ministry of Education (OME). (2015). *21st Century Competencies: Towards defining 21st Century competencies for Ontario.* Toronto, ON: Queen's Printer for Ontario.

Pellegrino, J.W., & Hilton, M.L. (Eds.). (2012). *Education for Life and Work: Developing transferable knowledge and skills in the 21st Century.* National Research Council. Committee on Defining Deeper Learning and 21st Century Skills, Board on Testing and Assessment and Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Schleicher, A (2018), *World Class: How to build a 21st Century school system, strong performers and successful reformers in education.* Paris, France: OECD Publishing. Retrieved from http://www.oecd.org/education/world-class-9789264300002-en.htm

Trilling, B., & Fadel, C. (2009). *21st Century Skills: Learning for life in our times.* San Francisco, CA: Jossey-Bass.

Websites

20 Time: http://www.20time.org

Canada 150: http://canada.pch.gc.ca/eng/1469537603125

Canada A Nation of Innovators: https://www.ic.gc.ca/eic/site/062.nsf/vwapj/InnovationNation_Report-EN.pdf/$file/InnovationNation_Report-EN.pdf

Canadian Foundation for Innovation: https://www.innovation.ca

Canadian Innovation Exchange: http://canadianinnovationexchange.com/2017/

Dictionary of Canadian Biography: http://www.biographi.ca/en/

Genius Hour: http://www.geniushour.com

Google Innovation : http://www.ctvnews.ca/sci-tech/10-canadian-finalists-named-in-google-s-5m-innovation-challenge-1.331831

Governor General's Office: https://www.gg.ca/index.aspx

Historica Website: http://www.thecanadianencyclopedia.ca/en/learningcentre/for-educators/

Canadian Innovation Space: https://canadianinnovationspace.ca/

Innovation Culture Canada: www.https://canadianinnovationspace.ca/

Organization for Economic Cooperation and Development (OECD): http://www.oecd.org/fr/innovation/innovating-education-and-educating-for-innovation-9789264265097-en.htm.

TVO: http://tvo.org/education

Appendix I

Innovation Videos

Canada: A Nation of Innovators
www.youtube.com/watch?v=AI-4OT4h_JY

How Do Innovators Innovate?" E4I Video
https://canadianinnovationspace.ca/resources/what-exactly-is-innovation/

Implementation of Education for Innovation at John Sweeney School
https://canadianinnovationspace.ca/resources/

Investigate! Invent! Innovate! Program
https://www.youtube.com/watch?v=BrAegnt4IG0&feature=youtu.be

Ingenious & Innovation Nation Videos

Smarter

Radio **1927 Edward Rogers Sr. developed first commercially viable all-electric radio in Toronto:** *https://www.youtube.com/watch?v=tqJQPFrcV6c*

Smaller

Dog Sled *Far & Wide - Meet The Inuit Sled Dogs Of Nunavut*:
https://www.youtube.com/watch?v=cyzu3459uYE
Snowshoes of the Cree Nation of Chisasibi:
https://www.youtube.com/watch?v=3FO88yMvC8g

Kinder

Wheelchair **Brooke Nevin Teachers Canada Something About the Electric Wheelchair**:
https://www.youtube.com/watch?v=Agza6sPfqKo
Blue Box Recycling *Nyle Green Bin:*
https://www.youtube.com/watch?v=V4NKWJB-pIc
How to build an Igloo- **A Boy Among Polar Bears:**
https://www.youtube.com/watch?v=R-x5QOSqP3E
Blue Box Recycling – **What Happens to Your Recycling in Waterloo Region:**
https://www.youtube.com/watch?v=u3w-UTrdE50

Safer

Igloos- *How an Igloo Keeps You Warm*:
https://www.youtube.com/watch?v=1L7EI0vKVuU

Healthier

Insulin - **Dr. Fredrick Grant Banting Canadian Medical Hall of Fame 1994:**
https://www.youtube.com/watch?v=WnME08SiJ0k

Wealthier

Trivial Pursuit- **How to Play Trivial Pursuit:** https://www.youtube.com/watch?v=w4LEGSYwk-0

Happier

Superman – **Is Superman Part of Canadian?**
https://www.youtube.com/watch?v=daj2nwvefTA
Superman – **Superman Historica Minutes:** https://www.youtube.com/watch?v=XO9Pe7UnHr0

Glossary

- **Ideation:** The process of developing and creating concepts or ideas for an innovation.
- **Imagination:** The process of using thoughts to form ideas, concepts or images.
- **Impact:** The potential effect made by an action, process or product and the difference that it makes to address an issue. Impacts can be related to areas such as health, safety economics, entertainment, communications, and societal needs.
- **Impediment:** An obstacle or challenge that becomes evident during the innovation process.
- **Implementation:** The process of putting a plan into effect: young innovators may develop a plan addressing how they will put their innovation into action and share it with others.
- **Improvement:** The process of adjustment to make something better. An improvement can be adding onto an idea or innovation, or it can be addressing an impediment or issue.
- **Incorporation:** The act of registering an innovation as a business or social enterprise.
- **Incubation:** The phase of innovation where innovators test, improve, grow and assess the effectiveness of their innovation.
- **Initiative:** The act of taking the responsibility to be proactive and address a situation.
- **Innovation Celebration:** An Innovation Celebration is an event that showcases the work of Innovation Teams. It provides innovators with an opportunity to share their ideas, prototypes, achievements and challenges. An Innovation Celebration can be held in a classroom, community centre or online through a virtual platform. The innovations can be presented on a small scale or shared with the wider community.
- **Innovation Space:** An Innovation Space is a designated area that provides learners with a temporary or permanent centre to: conduct research; examine innovations; develop, make or create innovations; and meet with other innovators or mentors. Educators can designate a location for the Innovation Space in the learning environment or the Innovation Space could be an online shared platform. Educators can provide interesting and relevant materials in the Innovation Space and learners can contribute to the Innovation Space by adding additional artifacts from home or examples/articles from media resources. An Innovation Space can also be a place to display Canadian innovations and learner-created Innovation Projects at various stages of completion. The concept of a Makerspace can be expanded into an Innovation Space for increased capacity and a wider scope including the development of social innovations.
- Some materials that educators may want to include in an Innovation Space are:
  - Canadian innovation examples (innovations can be diverse or grouped to represent a topic)
  - Samples of books about innovation (e.g., *Innovation Nation, Ingenious*)
  - Technology: tablet or laptop, QR Code Scanners, printer, 3D Printer, virtual reality viewers, digital cameras, magnifying glass, microscope
  - Recycled materials: wrapping paper, wallpaper, plastic containers and lids, paper rolls, twist ties, string pieces, Styrofoam, wooden pieces, popsicle sticks, straws, egg cartons
  - Art supplies: glue, paper clips, pieces of Velcro, tape, string, elastic bands, paper, clipboards, post-it notes, cards, small white boards or chalkboards, markers, pencils, pens, crayons, pencil crayons, paint, bingo dabbers
  - Building materials: marbles, discs, wheels of varying sizes, toothpicks, tubes, plasticine or play dough, pompoms, beads, bells, drums
  - Natural materials: twigs, rocks/stones, shells, feathers

- o Conceptual materials such as brochures or links to sites that describe social innovations for inspiration to learners
- **Innovation:** Innovation is the creation or improvement of a process or product to make an impact. Innovation is the application or implementation of ideas to real-world situations to make a difference.
- **Inquiry:** The process of asking questions and researching ideas, innovations, problems, or issues.
- **Inspiration:** To be influenced and motivated to be creative, positive and impactful.
- **Integration:** To combine diverse people or ideas for greater collaboration and effect.
- **Intellectual property:** A work or innovation that is the result of creativity, to which one has rights and for which one may apply for a patent, copyright, trademark, E.g. An innovation that is the product of one's creativity or design and is owned by the innovator(s).
- **Interaction:** To work with others collaboratively and in a reciprocal fashion for mutual benefit
- **Invention:** An invention is the creation of a new item or device that has not previously existed and may not have been implemented with impact.
- **Investigation:** To carry out an inquiry or research about something or someone in order to examine an area of study.
- **Investment:** Financial support for the development or production of an innovation.
- **Iteration:** The repetition of a process or procedure to result in a new or improved of a version of the innovation.
- **Prototype:** A beginning model or design of an innovation that is used as an example for subsequent models.
- **QR Technology:** A Quick Response code is a type of barcode that, when scanned by apps such as QR Scanner (found in the Appstore or on Google Play), directs viewers to webpages or additional links providing particular information. QR Codes can be created for free through various online QR platforms.
- **Start-up:** the action of setting up or launching an innovation or a newly established business or social enterprise.

Innovation for Good

Innovators will be:

1. Trusting and respectful:

   Build trust and mutual respect among innovators and consumers

2. Transparent and provide choices:

   Be consistently honest and give consumer options

3. Aware of work-related implications:

   Consider the effects on jobs and careers

4. Diverse and Inclusive:

   Recognize biases, make accommodations and ensure equitable access

5. Mindful of impacts on people and the environment:

   Predict and mitigate potential negative impacts

6. Proactive and collaborative:

   Work with stakeholders and policymakers

CANADIAN
INNOVATION
SPACE

INNOVAZONE
CANADIENNE

RHF
FRH

Fondation
Rideau Hall
Foundation