

**Athens Institute for Education and Research
ATINER**



**ATINER's Conference Paper Series
EDU2018-2489**

**Education for Innovation (E4I):
A National Initiative Promoting Innovation in Canadian
Schools**

**Daniel H. Jarvis
Professor of Education
Nipissing University
Canada**

**Maria T. Cantalini-Williams
Professor of Education
Nipissing University
Canada**

**Glenda L. Black
Associate Professor of Education
Nipissing University
Canada**

An Introduction to
ATINER's Conference Paper Series

Conference papers are research/policy papers written and presented by academics at one of ATINER's academic events. ATINER's association started to publish this conference paper series in 2012. All published conference papers go through an initial peer review aiming at disseminating and improving the ideas expressed in each work. Authors welcome comments

Dr. Gregory T. Papanikos
President
Athens Institute for Education and Research

This paper should be cited as follows:

Jarvis, D. H., Cantalini-Williams, M. T., and Black, G. L. (2018). "Education for Innovation (E4I): A National Initiative Promoting Innovation in Canadian Schools", Athens: ATINER'S Conference Paper Series, No: EDU2018- 2489.

Athens Institute for Education and Research
8 Valaoritou Street, Kolonaki, 10671 Athens, Greece
Tel: + 30 210 3634210 Fax: + 30 210 3634209 Email: info@atiner.gr URL:
www.atiner.gr
URL Conference Papers Series: www.atiner.gr/papers.htm
Printed in Athens, Greece by the Athens Institute for Education and Research. All rights reserved. Reproduction is allowed for non-commercial purposes if the source is fully acknowledged.
ISSN: 2241-2891
07/08/2018

Education for Innovation (E4I): A National Initiative Promoting Innovation in Canadian Schools

Daniel H. Jarvis

Maria T. Cantalini-Williams

Glenda L. Black

Abstract

The Rideau Hall Foundation (RHF) in Ottawa, Canada selected the Schulich School of Education (SSoE) as the faculty of education that would be tasked with creating educational resources that would correspond with the release of two new publications (*Innovation Nation: How Canadian Innovators Made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier, and Happier* (2017) written for younger readers; and *Ingenious: How Canadian Innovators Made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier, and Happier* (2017) written for older/adult readers. Both books were co-authored by The Right Honourable David Johnston (former Governor General of Canada) and Dr. Tom Jenkins as part of the *Canada 150* (our sesquicentennial) celebrations. The SSoE organized school teacher writing teams in summer 2017 and produced three generic educational resources (Early Learning/Kindergarten; Grades 1-8; and Grades 7-12) that were made freely available via the Canadian Innovation Space website (<https://canadianinnovationspace.ca/>), and which included a newly-developed Innovation Cycle model, sample key innovation activities, and suggestions for culminating Innovation Celebrations. Teacher candidates from participating SSoE faculty classes also created grade-specific Innovation units and these new resources were subsequently revised by teacher teams and then piloted/evaluated by teachers from within different educational contexts (e.g., public schools, private schools, homeschools). This paper discusses the *process* of how the writing team, which included pre-service teachers, in-service teachers, and education researchers, developed the E4I resources, and also briefly highlights the creation of a national partnership of Canadian organizations that have worked together to promote innovation in Canada.

Keywords: Innovation, Education, Curriculum, Interdisciplinary.

Acknowledgments: Our thanks to the Rideau Hall Foundation for project funding; to Nipissing University for their administrative support; and to all of our participating pre-service and in-service teachers for their incredible creativity and enthusiasm in writing, implementing, and providing feedback on the units.

Introduction

The Rideau Hall Foundation (RHF) in Ottawa, Canada selected the Schulich School of Education (SSoE) as the faculty of education that would be tasked with creating educational resources that would correspond with the release of two new publications (*Innovation Nation: How Canadian Innovators Made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier, and Happier* written for younger readers; and *Ingenious: How Canadian Innovators Made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier, and Happier* written for older/adult readers (Figure 1).

Figure 1. *Two Canadian innovation books released in English and French versions*



Both books were co-authored by The Right Honourable David Johnston (former Governor General of Canada) and Dr. Tom Jenkins as part of the *Canada 150* (our sesquicentennial) celebrations. The SSoE organized school teacher writing teams in summer 2017 and produced three generic educational resources (Early Learning/Kindergarten; Grades 1-8; and Grades 7-12) that were made freely available via the Canadian Innovation Space website (<https://canadianinnovationspace.ca/>), and which included a newly-developed Innovation Cycle model, sample key innovation activities, and culminating Innovation Celebrations.

Teacher Candidates from participating SSoE faculty classes also created grade-specific Innovation Units and these new resources were subsequently revised by teacher teams and then piloted/evaluated by teachers from within different educational contexts (e.g., public schools, private schools, homeschools). This paper discusses the *process* of how the writing team, which included pre-service teachers, in-service teachers, and education researchers, developed the E4I

resources, and also highlights feedback from educators who implemented the new resource *products* that were created and made available online as part of this national innovation initiative.

Development of the E4I Resources

In the 2016-17 academic year, Bachelor of Education teacher candidates from participating SSoE faculty classes were also invited to create full units relating to the new books (*Ingenious; Innovation Nation*), and then these units were internally adjudicated and a shortened list of the best materials were revised for pilot implementation in Ontario schools. After these grade-specific units were developed, we realized that an Innovation Cycle pertained to all of the units, and that there was clearly a generic set of experiences/lessons that were related to innovation skills and mindsets. Therefore, we decided to further developed three generic unit resources (Kindergarten; Grades 1-8; Grades 7-12) that were then revised by school teachers in summer 2017, and posted for public access on the then entitled “Canadian Innovation Culture” website. All of the units featured a newly developed Innovation Cycle model, sample activities, and suggested culminating projects/events.

The RHF provided additional funding for 2017-18 that includes a research component that would focus on: (i) the process of how the *Education for Innovation* (E4I) team and resources were formed, and (ii) formalized feedback on the Ontario innovation units (i.e., E4I product research) before they are released online as an educational resource for teachers.

E4I Research Study (in Progress)

This research study involves university faculty, school teachers, and para-educational agency partners with a view to encouraging joint research participation, new learning, and knowledge mobilization (McIntyre, 2005; Williams & Coles, 2007). The current research study is framed by an improvement-oriented, developmental evaluation model (Gamble, 2008; Patton, 2002) because it is a method known to be efficacious in gathering data about many stakeholders’ views, expectations, and impacts of a particular initiative. Developmental Evaluation is an evaluation approach that aims to support the development of an innovation. This aim is achieved through supporting participants’ information needs through evaluative inquiry as the participants work to implement and refine a process or product, in this case the formulation of the resource development team and national partners expansion, as well as the creation of the new Education for Innovation (E4I) innovation units that are being implemented by a select group of Ontario educators. Gamble in his 2008 work, *A Developmental Evaluation Primer*, described the definition, methods, and challenges of implementing Developmental Evaluation (DE) in the following way:

Innovation is commonly understood to be the introduction of something new and useful. For the purposes of developmental evaluation, it is important to make some distinctions. Developmental evaluation applies to an ongoing process of innovation in which both the path and the destination are evolving. It differs from making improvements along the way to a clearly defined goal. Where more traditional approaches to evaluation try to predict the outcomes of the innovation and focus measurement on those goals, developmental evaluation is intended to support innovation within a context of uncertainty. The ‘developmental’ in developmental evaluation is based on the innovation driving change. . . . Innovation is distinct from improvement in that it causes reorganization at a systems level and can occur at the level of an organization, a network or society at large. . . . Developmental evaluation makes use of methods familiar to evaluation: surveys, interviews and observations, among others. There are also some tools from complexity science that hold promise for informing developmental evaluation. (pp. 13-19)

In Complexity Theory there is a concept known as “enabling constraints” that has been specifically applied to educational contexts (Davis et al., 2008; Klinger et al., 2012). In brief, “enabling constraints” are defined as limiting factors that potentially serve to increase productivity and/or creativity within a system. Likewise, Jarvis (2006, 2009) developed a similar notion which he entitled “parametric creativity,” and defined it as follows: “A negotiation strategy for curriculum and professional development in which participants are given a specific, yet unscripted assignment by the organizing individual/group in such a way as to facilitate critical thinking and creative expression within the prescribed parameters” (Jarvis, 2009, p. 235). The related Parametric Creativity Curriculum Negotiation model involves four key factors: parameters, size of group, communication, and time frame. The survey research study focuses on the development of both the project faculty members and national partnership team (i.e., the Process) as well as the created E4I educational resources (i.e., the Products). Within developmental evaluation research, products created within a system can also be analyzed by participants and/or the researchers. In this case, the E4I units of study were piloted in select schools and other educational settings (private schools, home schools) and were implemented by volunteers who provided us with valuable feedback via an online survey.

Research Questions

This paper which focuses on the process of how various stakeholders created the E4I resource products and made them available online for teachers is actually part of a larger national RHF project that seeks to enhance innovation education and participation across Canada. Four overarching research questions formed the basis of our 2-part (process/product) study:

E4I Process Questions: (1) What were the experiences of those involved in the development of the resources? (2) What are some benefits and challenges identified within this developmental process?

E4I Product Questions: (3) What is the implementation feedback from teachers regarding the *Education for Innovation* (E4I) resource documents? and 4) What are recommendations for future revisions of the E4I resources?

These questions were used to develop online survey research questions (see Appendix A and B).

Research Methods

Online survey research (*Qualtrics* software) was used for both the Process and Product studies, both of these involving approximately 20 participants including teachers, curriculum writers and reviewers, faculty members, project organizers, and national partner members. The survey data was entered into *Atlas.ti* qualitative software for the process of Thematic Analysis, i.e., familiarization with data, generating initial codes, searching for emergent themes among codes, reviewing themes, defining and naming themes, and producing a report (Creswell, 2009; Guest et al., 2012; Miles & Huberman, 1994). Data is currently being analyzed in summer 2018 for both the Process and Product components, and unit revisions as well as further publications will result follow this analysis.

E4I Teacher Resource Development

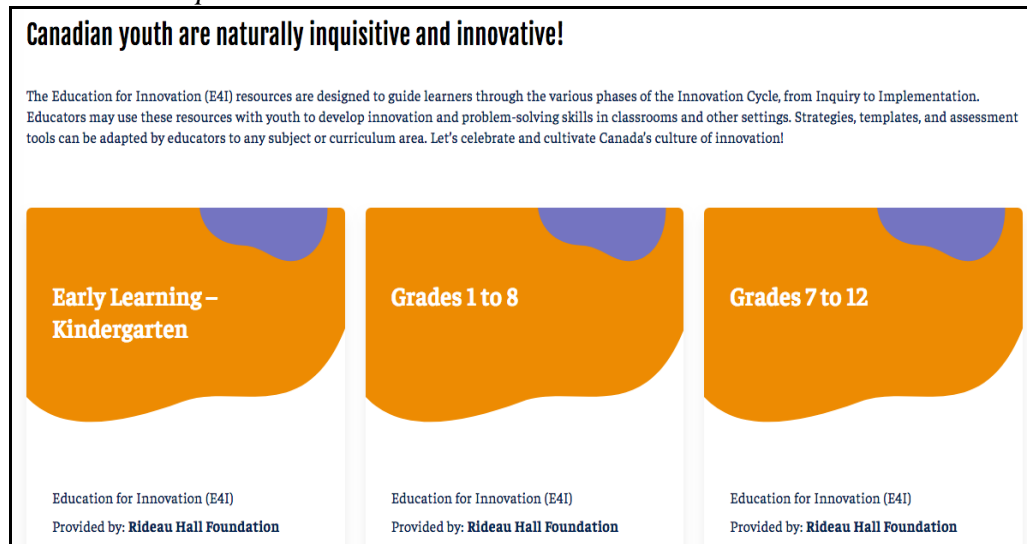
Although “innovation” as a concept has been variously defined in different countries and project initiatives (see for example Couros, 2015; Croscombe, 2018; Gabriel, 2016; Perimeter Institute for Theoretical Physics, 2017) the RHF project settled on the following clear definition: “Creating or improving a product (thing) or action (process) in order to make a positive impact (difference).” A new Canadian Innovation Space (CIS) website (Figure 2) has been designed, along with a new logo, to house various innovation resources/initiatives: (<https://canadianinnovationspace.ca/>).

Figure 2. *Canadian Innovation Space Website and New Logo*



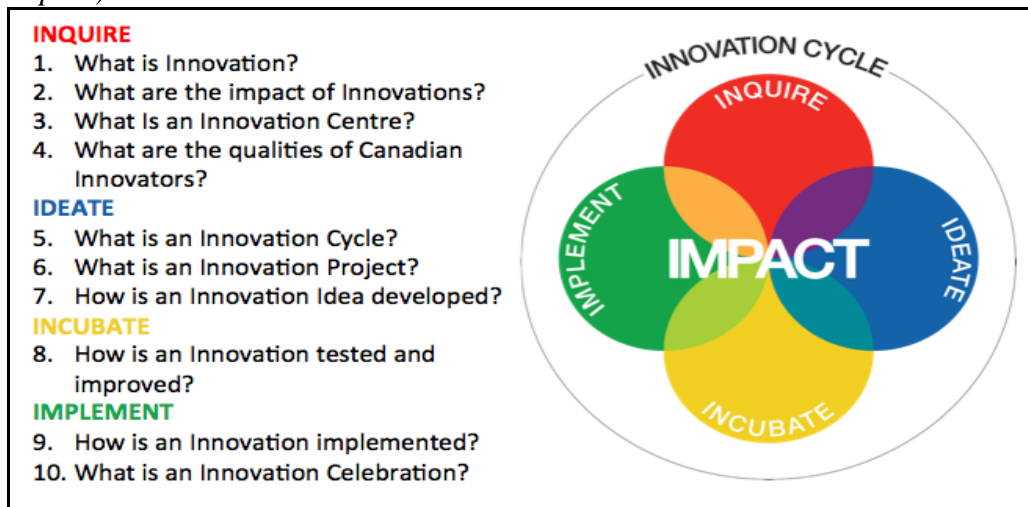
By clicking on the Resources link in the expandable menu of the website, one is redirected to a separate page that presents our three generic E4I units for free downloading. These three generic unit guides (Figure 3) focus by title on Early Learning/Kindergarten, Grades 1-8, and Grades 7-12, and they are available in both official languages of English and French. Over 1000 teachers have now been involved in the development and refinement of these three educational resources.

Figure 3. *Education for Innovation (E4I) Generic Units with Similar Structure/Components*



Common to all of these units of study is: (i) a look at specific Canadian innovations/innovators from our history; (ii) the presentation of our new Innovation Model (or Cycle) with its five key components of Inquire, Ideate, Incubate, Implement, and Impact (Figure 4); (iii) student engagement with the innovation process/projects; and (iv) sharing these projects in an Innovation Celebration.

Figure 4. *The Innovation Cycle (Inquire, Ideate, Incubate, Implement, and overall Impact)*



Further, a second series of grade-specific units for Grades 1-12, each based on different topics stemming from the provincial curriculum documents, have also been written and are currently being reviewed by Ontario educators. These innovation units cover a range of school subjects and sectors, and they complement existing entrepreneurship programming. What follows are the foci of the Grade 1-8 innovation units of study: (i) Grade 1: Seasonal; (ii) Grade 2: Community; (iii) Grade 3: Agricultural; (iv) Grade 3: Environmental; (v) Grade 5: Structures; (vi) Grade 6: Social; (vii) Grade 7: Medical; and (viii) Grade 8: Aviation. Grade 9-12 units are also being developed and piloted.

Eight national partner organizations (Figure 5) each having some meaningful connection with innovation education in Canada were invited by the Rideau Hall Foundation to begin meeting together, sharing ideas, and strategizing on future events and resources to promote innovation. This RHF partnership included the following seven other organizations: Schulich School of Education (SSoE) at Nipissing University, Perimeter Institute, Junior Achievement (JA) Canada, PowerPlay Strategies, Skills Canada, Young Entrepreneur Leadership Launchpad (YELL), and Ingenium.

Figure 5. National Partnerships (7) that have developed as part of the RHF Innovation Initiative



In May 2018, a national Innovation Week event took place across Canada with events happening in various provinces such as Ontario and British Columbia, highlights of which are now available on the CIS website (<https://canadianinnovationspace.ca/innovation-week/>). During the summer of 2018 we will be analyzing the research data from both the E4I Process and Product surveys, with a view to releasing updated E4I resources for teachers via the CIS website in 2018-19.

References

- Couros, C. (2015). *The innovator's mindset: Empower learning, unleash talent, and lead a culture of creativity*. San Diego, CA: Dave Burgess Consulting.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. Los Angeles, CA: Sage.
- Croscombe, N. (2018). Innovation. *Brock Education Journal*, 27(2), 48–52.
- Davis, B., Sumara, D., & Luce-Kapler, R. (2008). *Engaging minds: Changing teaching in complex times* (2nd ed.). New York, NY: Routledge.
- Fontana, A., & Frey, J. H. (2000). The interview: From structured questions to negotiated text. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 649–656). Thousand Oaks, CA: Sage.
- Gabriel, K. S. (2016). *The anatomy of innovation: What makes innovation succeed in the 21st century?* Dubuque, IA: Kendall Hunt Publishing.
- Gamble, J. A. A. (2008). *A developmental evaluation primer*. Montreal, QC: J. W. McConnell Family Foundation/DuPont Canada. Retrieved from http://communitysector.nl.ca/sites/default/files/practical_resources/2011/a_developmental_evaluation_primer_-_en.pdf
- Gore, J. M., & Gitlin, A. D. (2004). [Re]Visioning the academic-teacher divide: Power and knowledge in the educational community. *Teachers & Teaching*, 10(1), 35–58.
- Guest, G., MacQueen, K., & Namey, E. E. (2012). *Applied thematic analysis*. Thousand Oaks, CA: Sage.

- Jarvis, D. H. (2006). *Tracking the T.I.P.S. mathematics document: Curriculum negotiation and professional development models*. Unpublished doctoral thesis, University of Western Ontario, London, Ontario.
- Jarvis, D. H. (2009). *Parametric creativity: Curriculum Negotiation and professional development models in mathematics education*. Köln, Germany: Lambert. (ISBN 978-3-8383-1596-6)
- Johnston, D., & Jenkins, T. (2017). *Ingenious: How Canadian innovators made the world smarter, smaller, kinder, safer, healthier, wealthier, and happier*. Toronto, ON: McClelland & Stewart.
- Johnston, D., & Jenkins, T. (2017). *Innovation nation: How Canadian innovators made the world smarter, smaller, kinder, safer, healthier, wealthier, and happier*.
- Jones, S. (1985). Depth interviewing. In R. Walker (Ed.), *Applied qualitative research* (pp. 45–55). Aldershot, UK: Gower.
- Klinger, D. A., Shulha, L. A., Luce-Kapler, R., & Elliott, S. (2012). The enabling constraints of building an assessment pedagogy: Engaging pre-service teachers in a professional exploration of current conceptions of classroom assessment. *The European Journal of Social & Behavioural Sciences*, 1(1), 81-113. Retrieved from http://www.futureacademy.org.uk/files/menu_items/other/ejsbs8.pdf
- Kvale, S. (1996). *InterViews: An introduction to qualitative research interviewing*. Thousand Oaks, CA: Sage.
- MacDonald, D. (2017). *Canadian daily STEM activities, grade 6*. Chalkboard Publishing: Toronto, ON.
- McIntyre, D. (2005). *Bridging the gap between research and practice*. Cambridge Journal of Education, 35(3), 357–382.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.
- Patton, M. Q. (2011). *Developmental evaluation: Applying complexity concepts to enhance innovation and use*. New York, NY: Guilford Press.
- Perimeter Institute for Theoretical Physics. (2017). *Innovation 150: The power of ideas teacher's guide*. Waterloo, ON: Author.
- Rideau Hall Foundation. (n.d.). *Canadian innovation space*. Retrieved from <https://canadianinnovationspace.ca/>
- Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education and the social sciences* (3rd ed.). New York, NY: Teachers College Press.
- Williams, D., & Coles, L. (2007). Teachers' approaches to finding and using research evidence: An information literacy perspective. *Educational Research*, 49(2), 185–206.

Appendices

Appendix A: E4I Process Research Interview Questions

1. Please describe your role in the innovation project development.
2. Please describe how you came to be involved in the project.
3. What specifically were you tasked to do during the development of the innovation project?
4. What are your overall impressions of the innovation events and resources (e.g., E4I docs)?

5. What part(s) of the process seemed positive and/or beneficial to the overall project? What and/or who contributed to this positive aspect, in your opinion?
6. What part(s) of the process seemed negative and/or challenging to the overall project? What and/or who contributed to this negative aspect, in your opinion?
7. Can you describe a few key moments or decisions that occurred during the project development process that clearly had a significant effect on the direction or shape of the project?
8. What could the RHF or the project leader(s) have done differently to enhance the process?
9. What do you foresee as future potentialities and/or challenges for this innovation initiative?
10. Please provide any other feedback that you feel would improve the overall process.

Appendix B: E4I Product Research Survey Questions

1. Please provide the name of your school board and/or school context (e.g., name of publicly-funded school, private school, or homeschool context).
2. Please note the E4I resource/unit that was used.
3. Please note the grade level(s) with which the unit was implemented.
4. As a classroom teacher, what feature(s) of the E4I resource/unit were most useful to you? Please provide detailed and specific comments.
5. As a classroom teacher, what feature(s) of the E4I resource/unit may require some revision(s)? In other words, were there any poorly-worded instructions or problematic activities? Please provide detailed and specific comments.
6. Please describe your impressions regarding student engagement and the development of innovation learning skills during the unit, compared to other educational materials that you may have implemented with this group. If possible, please describe specific actions or comments made by students during this innovation unit.
7. Could you specifically comment on the culminating activity for the unit of study (e.g., Innovation Project and Celebration), in terms of how these were developed (e.g., How long did they have to work on these? Were they done individually or in pairs/groups? Did they submit plans, show progress, or plan budget?)?
8. Please discuss how the culminating activity (Innovation Project/Celebration) was organized (e.g., classroom, gymnasium, online)? What reasons did you and/or they have for designing it this way?
9. How was the culminating activity experienced and received by participants (e.g., students, peers, parents/guardians, others)?
10. What are your thoughts regarding future usage of the existing E4I resources?
11. How might teacher colleagues (i.e., other teachers in your school, or throughout Ontario/Canada) approach innovation unit implementation? In other words, what place do you think this may have?
12. If the E4I educational resources were to be made available online via D2L (Desire2Learn) Brightspace platform, how do you think this might affect the use of the educ. resource in Ontario?
13. Please comment on possible effective strategies to familiarize students with current/recent Canadian innovations in addition to those found in the books *Ingenious* and *Innovation Nation*.
14. Do you have any other related comments or ideas to add?