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Education for Innovation (E4I): Exploring the Developmental Process of a Canadian Curriculum Resource

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*The Rideau Hall Foundation (RHF) in Ottawa, Canada selected the Schulich School of Education (SSoE) at Nipissing University to create educational resources to correspond with the release of two 2017 publications (*Innovation Nation *written for emergent readers; and* Ingenious *written for older readers. Both books were co-authored by The Right Honourable David Johnston, 28th Governor General of Canada and Tom Jenkins as part of the Canada 150 sesquicentennial celebrations. The SSoE organized school teacher writing teams in summer 2017 and produced three cross-curricular* Education for Innovation (E4I) *resources (Early Learning; Grades 1-8; Grades 7-12) each of which included an Innovation Cycle model, sample key innovation learning experiences, and suggestions for culminating Innovation Projects. Teacher candidates from participating SSoE faculty classes also created curriculum-specific Innovation units which were subsequently revised by teacher teams and then implemented and reviewed by teachers from different educational contexts (e.g., public schools, private schools, homeschools). The* E4I *project collaboration involved university faculty, teachers, teacher candidates, and community partners. Based on participant survey data, researchers identified reported benefits and challenges relating to the overall developmental process. Findings indicate that the experiences of inquiring, ideating, incubating, and implementing the* E4I *resources closely reflected the phases found within the Innovation Cycle model. Feedback from teachers confirmed the usefulness of* E4I *for promoting innovation skills and mindsets in their students. Further themes emerging from the process survey data analysis include the evidence of, and need for: solid leadership, flexible support, iterative mindsets, and organic organizational structures.*

La Fondation Rideau Hall (FRH) à Ottawa, Canada, a sélectionné la Schulich School of Education (SSoE) de l'Université Nipissing pour élaborer des ressources didactiques dans le cadre de la publication de deux livres en 2017, Innovation Nation *pour lecteurs débutants et* Ingenious *pour lecteurs plus âgés. Les deux livres ont été rédigés par le très honorable David Johnston, 28e Gouverneur général du Canada, en collaboration avec Tom Jenkins dans le cadre des célébrations du cent-cinquantenaire du Canada. La SSoE a organisé des équipes de rédaction pour enseignants à l'été 2017 et a produit trois ressources multidisciplinaires portant sur l'éducation pour l'innovation (*E4I*), chacune comportant un modèle du cycle d'innovation, un échantillon des expériences d'apprentissage axées sur l'innovation et des suggestions axées sur les projets de l'innovation comme activité culminante. Des stagiaires suivant des cours avec l'équipe professorale de SSoE ont également créé des unités portant sur l'innovation alignées avec les programmes d'études. Par la suite, des équipes d'enseignants ont révisé les unités et des enseignants de divers contextes éducationnels (par exemple, écoles publiques, écoles privées,*

enseignement à domicile) les ont mises en œuvre et les ont commentées. Le projet E4I *a impliqué la collaboration du personnel enseignant de l'université, d'enseignants, de stagiaires et de partenaires communautaires. À partir des données de sondages, les chercheurs ont identifié les avantages et les défis de l'ensemble du processus de développement. Les résultats indiquent que les expériences consistant à poser des questions, à imaginer, à réfléchir et à mettre sur pied les ressources* E4I *correspondent étroitement aux phases du modèle du cycle de l'innovation. La rétroaction des enseignants a confirmé l'utilité de* E4I *pour les compétences et les mentalités en innovation chez les étudiants. L'analyse des données du sondage a également fait ressortir la présence, et le besoin, d'un leadership solide, d'un appui souple, de mentalités itératives et de structures organisationnelles organiques.*

RHF Project Background

The Rideau Hall Foundation (RHF) in Ottawa, Canada selected the Nipissing University Schulich School of Education (SSoE) as the faculty of education that would be tasked with creating educational resources to 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 emergent readers; and *Ingenious: How Canadian Innovators Made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier, and Happier* written for older students and adult readers (Figure 1).

Both books were co-authored by The Right Honourable David Johnston, 28th Governor General of Canada and Tom Jenkins as part of the *Canada 150* (our sesquicentennial) celebrations. The SSoE organized school teacher writing teams in summer 2017 and produced three cross-curricular *Education for Innovation* (E4I) resources (i.e., 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 learning experiences, and culminating Innovation Celebrations.

In the 2016-17 academic year, Bachelor of Education teacher candidates from participating SSoE faculty classes were invited to create full-grade and curriculum-specific innovation units relating to the new books (*Ingenious; Innovation Nation*), and then these units were internally adjudicated and a shortened list of the most comprehensive Innovation Units were revised for pilot implementation in Ontario schools. After these grade- and curriculum-specific units were

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

Figure 2. Canadian Innovation Space website and new logo.

developed, we realized that an Innovation Cycle with certain phases 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, the faculty writing team decided to further develop three 'framework/generic' cross-curricular teaching resources (Early Learning/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 titled "Canadian Innovation Culture" website. The generic teaching resources and the grade-specific innovation units all featured a newly developed Innovation Cycle model, sample activities, and suggested culminating projects/events. From this point, the three cross-curricular resources became known to as 'generic' *Education for Innovation* (E4I) resources.

Although innovation as a concept has been variously defined in different countries and project initiatives (see for example Couros, 2015; Crossecombe, 2018; Gabriel, 2016; Kelly, 2016; Perimeter Institute for Theoretical Physics, 2017) the RHF project settled on the following definition: "Innovation is the creation or improvement of a product (thing) or action (process) in order to make a positive impact (difference)." In 2018, a new Canadian Innovation Space (CIS) website (Figure 2) was designed by RHF, along with a new logo, to house various innovation resources and initiatives: (https://canadianinnovationspace.ca/).

By clicking on the Education Resources link in the expandable menu of the website, one is redirected to a separate page that presents our three generic E4I education resources for free downloading. These three generic education resources (Figures 3, 4, and 5) were focused by title on Early Learning/Kindergarten, Grades 1-8, and Grades 7-12, and were made available in both official languages of English and French.

Common to all of the *Education for Innovation* resources are: (i) an inquiry of specific Canadian innovations and innovators from our history; (ii) the presentation of our new Innovation Cycle with its four components of Inquire, Ideate, Incubate, Implement, focussed on

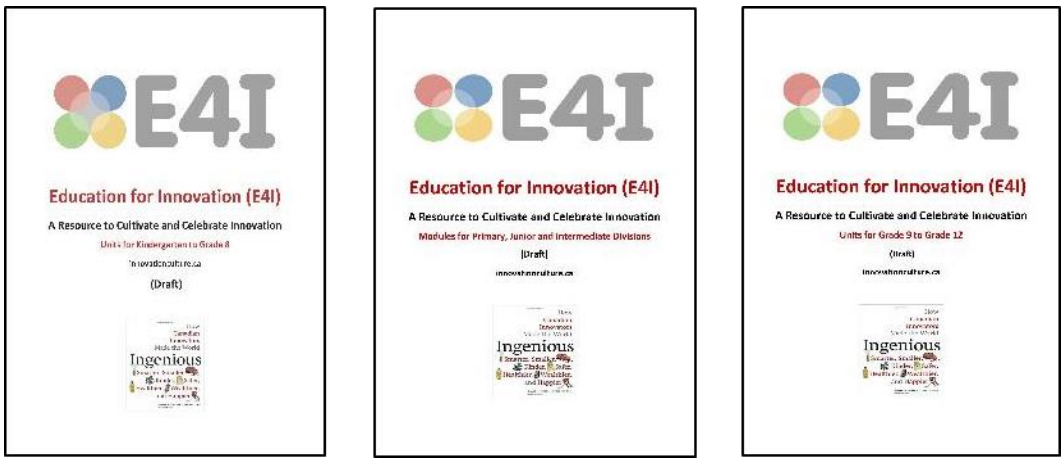

Figure 3. Original covers of E4I resources, each with similar structure and components.

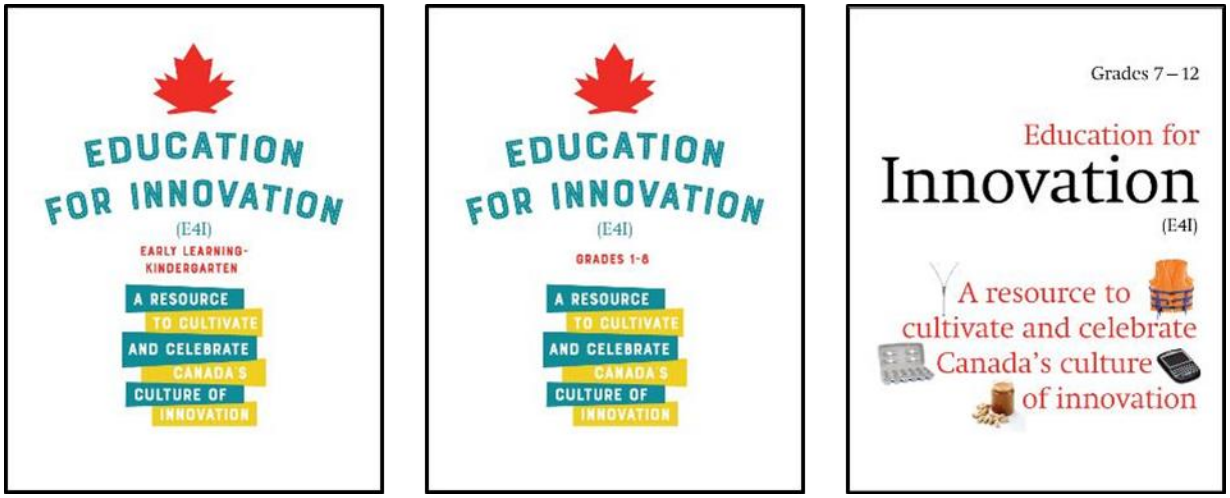

Figure 4. Further developments of the E4I generic education resources.

Figure 5. Final 2018 versions of the E4I resource covers.

the central component of Impact (Figures 6-8); (iii) student engagement with the innovation process and projects; and (iv) sharing these projects in an Innovation Celebration. Figure 6 represents the initial development of the Innovation Cycle including the four key components and the central component of Impact. Figure 7 represents the partners' vision of the Innovation Cycle and Figure 8 represents the most recent versions of the Innovation Cycle incorporating the new logo of the Rideau Hall Foundation's, Canadian Innovation Space initiative.

Further, a second series of grade-specific units for Grades 1-12, each based on different topics stemming from the provincial curriculum documents, were drafted and reviewed by Ontario educators. These innovation units covered a range of school subjects and sectors, and they complemented existing Ontario Curriculum topics and programming. The foci of the Grade 1-8 innovation units of study were, at the time of writing: (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, which were also developed and piloted with classroom teachers, focused on the following areas: Nutrition/Sports, Business, Indigenous History, Visual Arts, and Music.

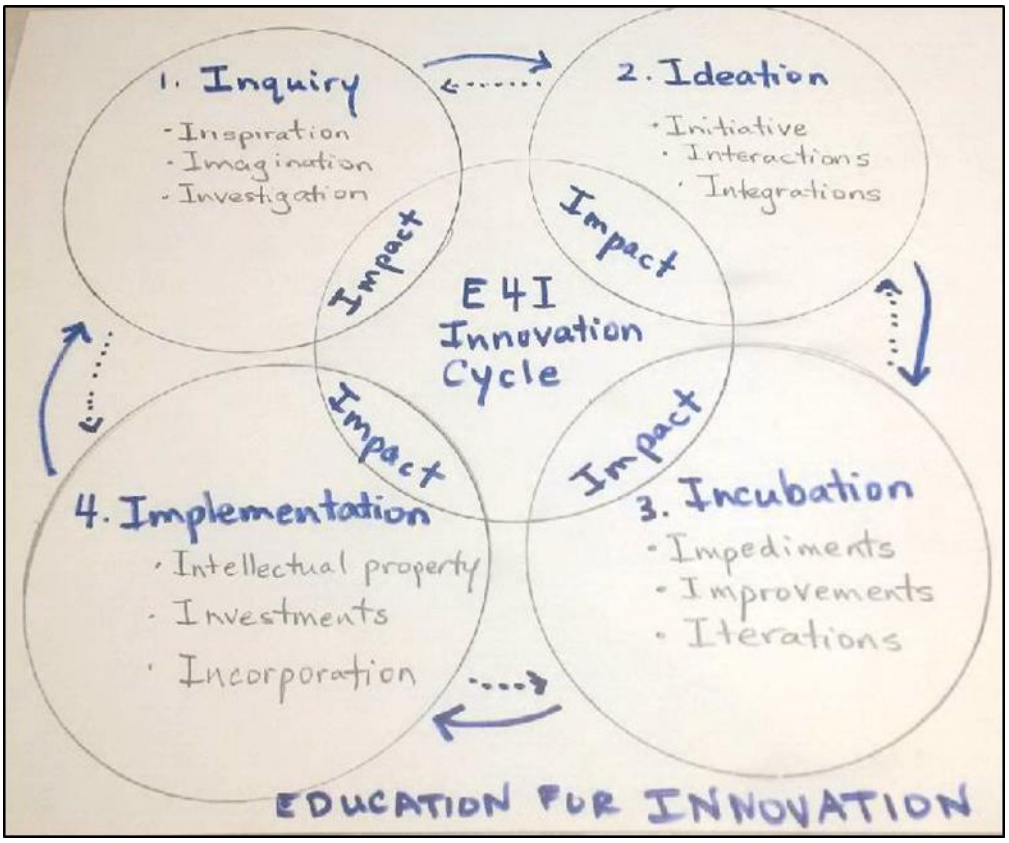

Figure 6. The Innovation Cycle (Inquire, Ideate, Incubate, Implement, and overall Impact).

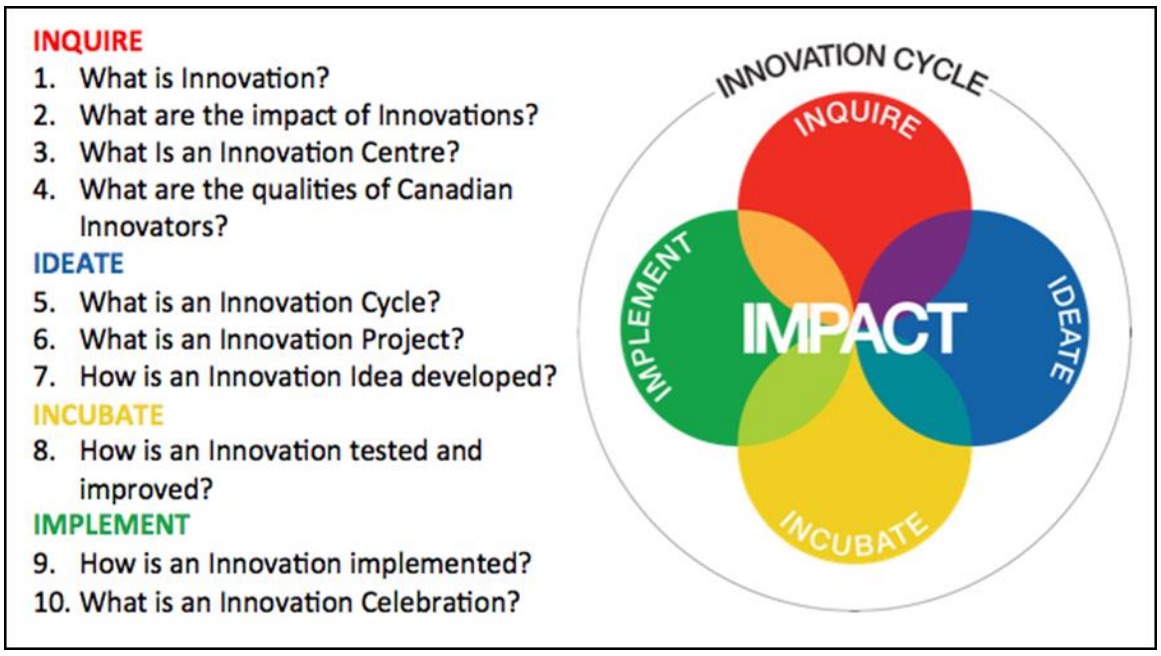

Figure 7. Early graphic design treatment of The Innovation Cycle.

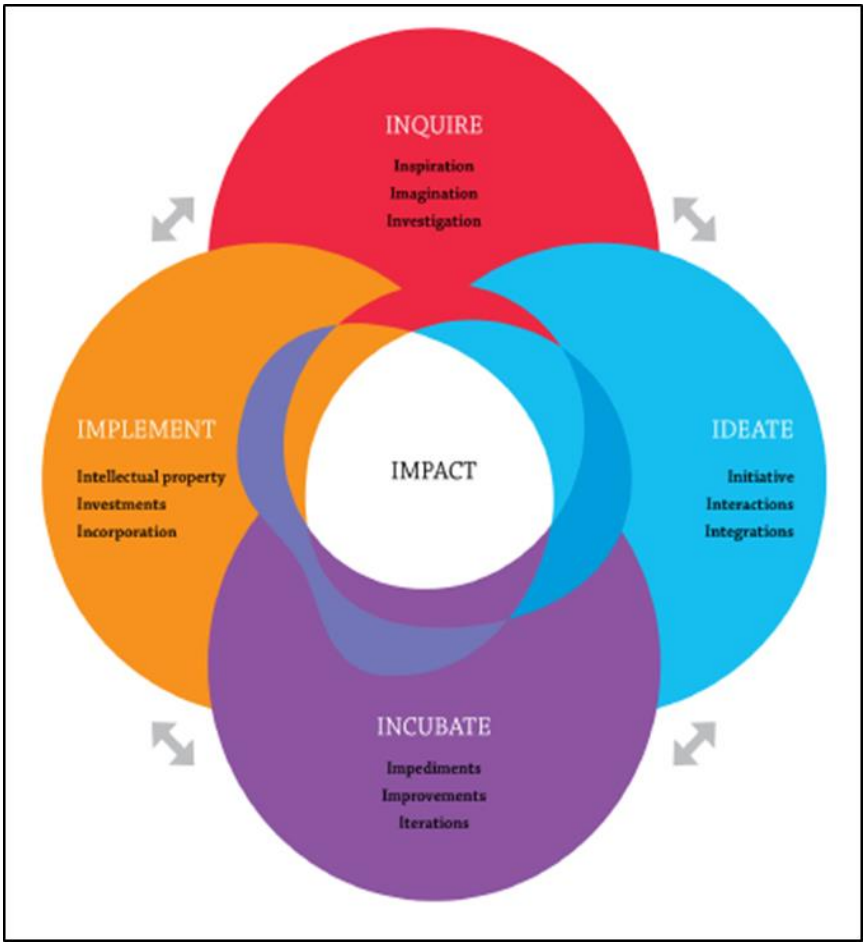

Figure 8. Final graphic design of The Innovation Cycle model.

Figure 9. Seven national partnerships developed as part of the RHF Innovation initiative.

Seven national partner organizations (Figure 9) each having some meaningful connection with innovation education in Canada were invited by the Rideau Hall Foundation in 2017 to begin meeting together, sharing ideas, and strategizing on future events and resources to promote innovation. This RHF partnership included the following seven 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 (i.e., a central organization which features links to the Canada Agriculture and Food Museum, Canada Aviation and Space Museum, and Canada Science and Technology Museum).

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/).

E4I Research Study

The RHF provided additional funding to the faculty team of the Schulich School of Education for 2017-18 that included a research component that would focus on: (i) the process of how the E4I team and resources were formed; and (ii) formalized feedback on the Ontario innovation units (i.e., E4I product research) before they were released online as an educational resource for teachers in Canada and beyond.

Literature Review

Developmental evaluation. This research study involved university faculty, teacher candidates, school teachers, and educational agency partners with a view to encouraging joint research participation, new learning, created and revised resources, and knowledge mobilization (McIntyre, 2005; Williams & Coles, 2007). The current research study was informed by an improvement-oriented, developmental evaluation model (Gamble, 2008; Patton, 2002, 2011) 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 E4I units that were 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:

> Initiatives that are innovative are often in a state of continuous development and adaptation, and they frequently unfold in a changing and unpredictable environment. … Adaptations are largely driven by new learning and by changes in participants, partners and context. … 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. (pp. 13-15)

The E4I project can clearly be described as exercise in developmental evaluation, as it involved all of the following DE characteristics: different stakeholder groups; flexible parameters around resource creation, modification, and revision; cyclical team review and partner input; innovation richly supported within an unpredictable context; and the ultimate goal of disseminating knowledge and new resources.

Curriculum development. Canadian contemporary curriculum theorists have significantly influenced 21st century curriculum development. For example, Jardine, Friesen, and Clifford (2006) proposed a "Curriculum of Abundance." Using the philosophical underpinnings of constructivism, Jardine et al. (2006) broke from the structured, flat, static, and "ordinariness" of curriculum and teaching to a curriculum in abundance, which "requires thinking and experiencing that is substantive, material, bodily, earthly, located specific" (p. xxiv). Engaging in a curriculum in abundance "enable[s] us to experience the world … as alive, indeed purposeful" (p. xiv). They further noted that "abundance is a practice" (2006, p. 10), but that it cannot be put into use in the pragmatic sense, as it is not an educational method. At its heart, curriculum in abundance is a mode of being.

Davis, Sumara, and Luce-Kapler (2015), however, proposed *Systemic Sustainability Education* that can indeed be put in practice in Canadian classrooms. They explained that teaching beliefs and practices have moved along a continuum of "moments," beginning with *Standardized Education* (1600s with public education and industrialization); *Authentic Education* (20th century human cognition complexity); *Democratic Citizenship Education* (fuelled by the inequities and injustices of the 1960's civil rights movement); and *Systemic Sustainability Education* (currently trending with an information-based society and an ecological mindset). Systemic Sustainability Education is the

> divergence toward new interpretive possibilities as it is about convergence onto pre-existent truths. It is participation in a recursively elaborative process of opening up new spaces of possibility by exploring current spaces—with regard to both curriculum content and modes of consciousness (pp. 217-218).

Learners are encouraged to engage in open-ended tasks and to go beyond planned experiences. To explain Systemic Sustainability Education in the classroom, the term *design* is preferred to *planned* lessons, as the "activities are intended to be accessible and engaging to the widest possible audience" (p. 218).

Designing and revising educational experiences for students is known as curriculum development. Print (1993) defined curriculum development as "the process of planning, constructing, implementing and evaluating learning opportunities intended to produce desired changes in learners" (p. 23). At the core of quality teaching and learning is curriculum development, which is often invisible to academic inquiry. With the exception of subject-specific studies (e.g., math and science: Clements, 2007; McFadden & Roehrig, 2017; Superfine, Kelso, & Beal, 2011), there is a dearth in the literature related to understanding educators' engagement in the curriculum development process in the elementary or secondary panels. However, there is a growing interest in the process of curriculum development at the post-secondary level, specifically in universities (Aziz et al., 2005; Hurlimann, March, & Robins, 2013). The existing literature provides insight into the factors that facilitate and inhibit curriculum development, and which can be translated to other educational contexts.

Facilitation and inhibition. Factors that enhance the facilitation of curriculum development include supportive educational philosophies (Buell Hart, 1986; Lillevang, Bugge, Beck, Joose-Rethans, & Ringsted, 2009; McFadden, & Roehrig, 2017; Robertson, 2007; Rosy, 2015) and knowledgeable and supportive leadership (Bordage, & Harris, 2011; Bryman, 2007; Hurlimann et al., 2013). In Myers and Schenkman's (2017) study, leadership was found to have an impact on positive group dynamics. According to Hurlimann et al. (2013), "Leadership appeared to be most valuable in so far as it related to fostering collegiality, collaboration and communication" (p. 646). They suggested that bringing together different perspectives with different considerations allows for openness of beliefs and values about the curriculum program (Hurlimann et al., 2013). Other factors related to a curriculum team's success, as identified by Myers and Schenkman (2017), were developing strong partnerships and collaboration throughout the curriculum development process, and that implementation is critical to the ultimate success of a curriculum development program.

Studies in the literature mention a range of factors that arise as challenges to curriculum development , and these would include the emotional dimensions of implementing change (Carse, 2015; King, 2007), politics (Bordage & Harris, 2011; Leathwood & Phillips, 2000), and cultural issues (Fourie, 1999; Rosy, 2015). A significant and consistent inhibitor to the curriculum development process was the lack of adequate time (Bhat, Pushpalatha, & Kulkarni, 2017; Hurlimann, et al., 2013)—the time it takes to research, develop, review, and revise the curriculum resources. In reviewing the literature, budget was also a factor that both facilitated curriculum development (Bhat, Pushpalatha, & Kulkarni, 2017; Buell Hart, 1986) and hindered such processes with budgetary constraints (Mok, 2005).

Valuing partnerships. Curriculum design is complex and fraught with challenges at all stages of the process (Bhat, Pushpalatha, & Kulkarni, 2017). Evaluating a university curriculum development process (Sidebotham, Walters, Chipperfield, & Gamble, 2017), participants described the experiences as "a transformative journey" which "focused on partnership in action" (p. 9). The leadership team was pivotal to the transformative results, as their actions were "encouraging, positive, mindful and enthusiastic, respecting and acknowledging other people's opinions, working in a cohesive manner, listening, providing verbal feedback and demonstrating a genuine desire for consultation" (p. 9). Participants felt like partners in the

process and this perception contributed to the curriculum development process; partners reported that they felt their opinions were valued and they were encouraged to share knowledge; buy-in among stakeholders strengthened their ownership of the curriculum development process (Sidebotham et al., 2017). Carse (2015) reported teachers' engagement with professional development was a contributing factor to their efforts and agency in facilitating and activating curriculum change. For sustained curriculum implementation, Carse (2015) recommends longer term professional development, time for teachers to engage in reflection of the process, and opportunities for collaboration and professional dialogue and learning.

Teachers as partners. In the 1960s, curriculum was developed in such a way that limited teachers' ability to make changes, which led to teacher resistance (Fullan & Hargreaves, 1992). Researchers began to acknowledge teachers' role in the curriculum development process, "the successful implementation of an innovative curricular program is dependent on the full active participation of the teachers involved in the decision-making process associated with the curriculum reform" (Ben-Chaim, Joffe, & Zoller, 1994, p. 365). To foster ownership and to counter teachers' resistance, they were included in the curriculum development process, which moved away from a top-down approach (Bakah, Voogt, & Pieters, 2012; Fullan & Hargreaves, 1992). However, limitations to teachers designing curriculum came in the form of practical challenges (e.g., time) and the lack of curriculum design expertise (Bakah et al., 2012). Huizinga, Handelzalts, Nieveen, and Voogt (2014) identified the gaps in teachers' curriculum design expertise as involving subject matter knowledge, pedagogical content knowledge, and curriculum consistency (internal and external). To support teachers in curriculum design, Huizinga et al. (2014) suggested providing support throughout all stages of the design process. Further, they noted that templates, curricular frameworks, and evaluation guidelines are essential tools for supporting teachers in the design of a quality lesson series (Huizinga et al., 2014, p. 54).

Curriculum lives inside the classroom, as teachers determine how students learn and the teaching strategies that will be used in their classroom. Combining curriculum design and professional development creates an independent process (Shawer et al., 2008). Professional development is integral to supporting teachers in their development of a curriculum program. Teacher professional development is critical to the curriculum development and implementation process to influence teachers' use of the materials in their practice; teachers also need to be provided with an overview of the curriculum program and its goals and features (Superfine et al., 2010). McFadden and Roehrig (2017) suggested that leaders in curriculum design must ensure that teachers are involved in curriculum design who are able to commit to developing curricular resources that will be used by other teachers, adding that this should be considered "a responsibility not to be taken lightly" (p. 20). Teachers, as curriculum designers, need to learn alternative skills beyond the brainstorming stage of development to understanding the broader goals and context (Davis et al., 2015; Dorst, 2011; Jardine et. al., 2006; McFadden & Roehrig, 2017).

Research findings regarding a participatory curriculum development process are presented by Sidebotham et al. (2017). Researchers worked with a representative sample of key curriculum development team members, interviewing them in relation to their participation in the shared development of a new Bachelor of Midwifery curriculum at an Australian university. The structures, processes, and resulting curriculum development framework are described in their paper, as well as two main emergent themes: (i) transformative journey, and (ii) a focused partnership in action (Sidebotham et al., 2017). Results confirmed that the participatory

curriculum development process provides symbiotic benefits to participants leading to individual and organizational growth and the perception of a shared curriculum. A final operational model is described as providing an appropriate structure to create meaningful collaboration with multiple stakeholders, and to produce a curriculum that is contemporary and research-based.

Teacher candidates' (i.e., pre-service teacher education students) engagement with curriculum development has yet to unfold in the literature. Lambert and Biddulph (2015) described "curriculum making … as a sophisticated process that requires creative boundary work from teachers … to make a curriculum that is worthwhile, engaging and relevant" (p. 216). The foundation of curriculum making is a "progressive conception of subject knowledge" (Lambert & Biddulph, 2015, p. 216). Lambert and Biddulph (2015) proposed that "curriculum making provides a framework that can deepen and strengthen the initial training … of teachers" (p. 210). As such, our E4I project focuses on a relatively new area of participatory curriculum development.

The 21st century learner. Scholars across disciplines agree that curriculum development is a process. Generally, they are in alignment on the order of the process, however, they are not in agreement on the specific number of steps or stages. For example, Kern, Thomas, Howard, and Bass (1998) noted 6 steps; McTighe and Wiggins (2012) noted 3 steps; Mooney and Mausbach (2008) noted 12 steps; and Queen's University (n.d.) noted 5 steps. The Kern et al. (1998) process arguably captures the essence of many of the other curriculum development models. To create curriculum resources that are responsive to 21st century learners, one can look to the work of Kern et al.'s (1998) six-step process for curriculum development within the medical field: (1) Problem Identification and General Needs Assessment; (2) Targeted Needs Assessment; (3) Goals and Objectives; (4) Educational Methods and Strategies; (5) Implementation; and (6) Evaluation and Feedback. This approach is presented as cyclical and interactive, and some steps may be accomplished simultaneously (Kern et al., 1998). Myers and Schenkman (2017) highlighted the fact that the Kerns model does not end with implementation, but rather concludes with an emphasis on evaluation and improvement.

The E4I resources, including the Innovation Cycle, the accompanying lessons, and the culminating innovation project integrate 21st century learning by including the knowledge and competencies of emerging technology and human learning that has the potential to lead students to becoming personally successful and actively engaged citizens. In Schleicher's (2018) words, speaking for the Organisation for Economic Co-operation and Development (OECD),

> It is likely that future work will pair computer intelligence with humans' social and emotional skills, attitudes and values. It will then be our capacity for innovation, our awareness and our sense of responsibility that will enable us to harness the power of artificial intelligence to shape the world for the better (p. 232).

The E4I resources provide educators with sophisticated collaborative and critical thinking learning opportunities. Trilling and Fadel (2009) pointed to critical and creative thinking which are "at the core of learning and innovation (p. 50)," and these types of thinking have been purposefully embedded within the E4I resources.

Within developmental evaluation research, both the process and the products created within a system can be analyzed by researchers and study participants, respectively. In this present study, both areas were explored via two separate online questionnaires.

Research Questions

Four overarching research questions formed the basis of our 2-part (process/product) study:

E4I Process.

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.

3. What is the implementation feedback from teachers regarding the E4I resource documents?
4. What are recommendations for future revisions of the E4I resources?

These four research questions were used to develop the two online questionnaires (Appendix A and B). Although the product questionnaire data was used to inform the ongoing development and revision of the E4I resources, in this paper we focus primarily on the process of how various participant groups created the E4I resource products and made them available for educators.

Research Methods

This qualitative study was submitted to, and approved by, the Nipissing University Research Ethics Board. As part of the qualitative data, participants completed an online questionnaire which was developed using *Qualtrics* software for both the process and product studies. Approximately 140 practicing teachers, 320 teacher candidates, and 8 school administrators were involved in the E4I curriculum design and review process, which lasted several years. From this larger group, 24 individuals responded to the Product Questionnaire invitation to participate. The Process Questionnaire invitation was sent out to those who were more involved in the overall E4I process, and this led to six individuals being willing to participate. Qualitative data also included artefacts related to the development of the curriculum products (e.g., development of innovation cycle model, related graphics, and unit drafts).

Data was entered into *Atlas.ti* qualitative software for the process of Thematic Analysis, i.e., familiarization with data, generating initial codes. The data was further analyzed by the researchers to search 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 was analyzed for both the process and product components.

Research Findings

In the following section, we first briefly discuss the product questionnaire findings which were used by the planning team to make ongoing revisions to the E4I resources, and then mainly focus on the process questionnaire findings which deal with how the E4I team and resources were developed.

Product Findings

Twenty-four participating teachers completed the E4I product questionnaire. Of this group of northern and southern Ontario teachers, two were from private schools, three were home school teachers, and the remaining 19 were elementary or secondary teachers from either the public or Catholic District School Boards. This variety in teacher context, geography, and grade level

provided us with a helpful range of perspectives in terms of the developmental evaluation of the *Education for Innovation* resources. Most of the 24 teacher participants were able to implement a full or partial innovation unit with their respective students; in the few instances where this was not possible, the participating teacher thoroughly read through the document and provided us with specific editorial feedback. The units that were implemented/reviewed, and the number of participants who reviewed each of them, were as follows: Early Learning/Kindergarten resource (5); Grades 1-8 resource (4); Grades 7-12 resource (4); Grade 1 unit (2); Grade 3 unit (3); Grade 6 unit (2); and the Grade 8 unit (4).

Feedback from the product questionnaires provided us with 43 pages of data based on the 14 questions (See Appendices A and B). This data was independently analyzed by several members of the research team, and then through discussions, was eventually organized into three categories: (i) small editorial changes that could be implemented immediately; (ii) more involved revisions related to rewriting of sections or the addition of new/missing material; and (iii) major restructuring ideas that would/could be dealt with in future iterations of the resources and units. The data was subsequently categorized into strengths, challenges, and potential changes to both the 'generic' resources and to the grade- and topic-specific units. Revisions based on (i) and (ii) were then undertaken by various members of the team, with a particular focus on the development and refinement of the three generic teaching resources which would be the first set to be translated and made available via the Canadian Innovation Space website (https://canadianinnovationspace.ca/). In the fall/winter of 2018-19, a thorough revision and rewriting process for the Innovation Units was undertaken by the faculty team to ensure that the topic-specific Innovation Units aligned with the generic resources, and were reflective of the feedback provided by participants in the Product Questionnaire.

Participating teachers provided useful feedback within the Product Questionnaire that was used to guide revisions of the E4I resource content. For example, participants reflected on the learning experiences that were suggested within the original Early Learning/Kindergarten resource:

> Teacher: I would make the Kindergarten activities either into multiple stations they could visit or shorten them. The Innovation station was set up during morning free play from 9:10 – 10:10 am. Students were free to cycle to other play-based learning stations if they wished. This meant that sometimes I had multiple students at the station and sometimes a pair and sometimes just one.

> Teacher: For Kindergarten, I narrowed the list of Canadian innovations to the ones I felt they may encounter (e.g., peanut butter, canoes, snowmobiles, dump trucks). We watched YouTube videos of these in action and that led to storytelling. A colleague made an innovation alphabet which taught 26 Canadian innovations.

Administrators and teachers highlighted 21st century skills and global competencies which they thought should be more directly addressed, where possible, within the E4I resources:

> Principal: Teachers commented that perhaps a greater connection to 21st century learning skills and striking a balance between content and skill-based activities.

> Teacher: In the near future, teachers across Ontario will be assessing and reporting on global competencies—skills that students will need to be successful in their future careers. These skills include creativity and collaboration. We will need to provide students with the opportunities to

develop and demonstrate these skills. The innovation unit implementation is an excellent way of doing this.

Participants also provided helpful recommendations around E4I access and implementation:

Teacher: Coordinating with teachers who are organizing Innovation Weeks at the beginning of the school year could be a great way to extend the learning to the school community.

Teacher: I think it is much more convenient for resources to be online.

Teacher: Perhaps there are innovations from their own community area that could be explored. Living in northern Ontario, we could research innovations specifically for this part of Ontario. It would be beneficial if the website was kept current with new additions.

Homeschool Teacher: It would be great if there was a mailing list that teachers and homeschool moms could subscribe to, which would send out emails every time there was a new Canadian Innovation (containing information and a picture of the innovation and innovator that could be printed out , shared, and celebrated with the kids that same week).

When asked about their overall impressions of the E4I resources, participants shared positive statements regarding potential usefulness and accessibility of the resources. For example, one member of the Steering Committee noted the following:

The E4I generic and grade-specific units are currently being revised based on teacher input, but overall, I think they will be widely used and a positive addition to teacher practice in Canada (and beyond?). The fact that they all share a common structure (innovation samples, innovation model, innovation project, innovation celebration), and approach curriculum with an interdisciplinary lens bodes well for the adoption of the resources, and will also make the sharing of student innovation samples easier in the years to come (i.e., a common language). In terms of the new attractive CIS website, I think it will be very effective for public interaction, especially since it is designed as a responsive tool (i.e., for monitors, tablets, and mobile devices), an updated tool (e.g., new innovation events/programs), and an interactive tool (e.g., potentially welcoming user videos to be uploaded; encouraging feedback from and communication between teachers). Having a central place to house all resources is excellent. (Steering Committee member)

Another Steering Committee member described the resources as "very thorough and well-vetted!" that they "reflect current teaching philosophies and mandates" and were "open ended where educators can pick and choose which resource to take on." A teacher participant shared that they were "very impressed with resources," and found them "easy to use, easy to understand, and easy to adapt for the classroom."

Process Findings

The six individuals who responded to the process questionnaire included four from the core Steering Committee made up of Schulich School of Education faculty members, one elementary teacher writer/reviewer, and one secondary teacher writer/reviewer. Although the questionnaire invitation was sent to a larger group of individuals, including members of the national

partnership, the timing of the questionnaire and the original distribution sent out over the summer months may have contributed to the lower participation rate of the national partners. A summary of the process findings in light of both the literature review framework and the emergent themes from the analysis of the questionnaire data is described in subsequent sections.

Role. As noted above, six participants completed the online questionnaire regarding project process, four of which were members of the core Steering Committee team, and represented teaching faculty members within the Schulich School of Education at Nipissing University. These four participants attended regular virtual and face-to-face meetings over a number of years, were involved with curriculum writing and revisions—sometimes with their own university Bachelor of Education degree students, and also took part in various related events such as Junior Achievement Day, Open Text event with The Right Honourable David Johnston, 28th Governor General of Canada and Tom Jenkins, and an information session held at the university's satellite campus in Southern Ontario, just to name a few. One of these four served as the Chair of the RHF Education Committee, and was responsible for obtaining the project contract and oversaw a large group of teachers, principals, writers, reviewers, graduate students, and faculty members throughout the life of the project. She noted:

> I was tasked to attend the Steering Committee meetings at Rideau Hall from December 2015 to December 2016. During these meetings, a very diverse group of individuals were developing the direction for the book *Ingenious* and for its ultimate distribution and usage. I was then tasked to form and chair an Education Committee as a subcommittee of the Steering Committee. This group determined the scope and goals of the Education Resource that would align with the book *Ingenious*. The next major task was developing a Nipissing University faculty team. This team undertook the task of using their varied courses to address the writing of the Innovation Units to align with the book *Ingenious*. I chaired this team for two years as we worked through the process of defining innovation, determining the content of Innovation Units, organizing two Innovation Celebration presentations, field-testing, and revising the resources and making supplementary videos.

Clearly, this represented a major role in the direction and development of the E4I resources, involving not only a large group of people but also a complex, multi-faceted project. The other two process questionnaire participants were writing/revision team members, one from the elementary school level and one from the secondary school level.

Overall impressions. When asked to share one's general perception of the *Education for Innovation* initiative, the Project Leader reflected on the entire process as follows:

> My overall impression is that I am definitely pleased and proud of our accomplishments. It has been a privilege to work with a team of dedicated Nipissing University faculty members and enthusiastic teacher candidates. Our resources have been well-received by teachers and school administrators. The three generic resources of the *Education for Innovation* series are very useful to address global competencies and curriculum expectations. They are also engaging for Canadian youth and integrate such approaches as design thinking and entrepreneurship. The Canadian Innovation Space website is very interesting and is an excellent repository for our resources.

The non-linear process involved in forming the original team, making critical decisions around resource content and scope, and managing the large group of volunteers was indeed a complex undertaking. In reflecting back on these years, several key moments were recognized.

Key moments. Several key moments, or decisions, characterized the process development of the E4I resources. One of the planning team members recalled four such moments:

> I can recall four definite key moments during the development of the E4I resources that had significant impact on the direction of the project: (i) the determination of the resource title (*Education for Innovation*); (ii) the determination of the finalized Innovation Model/Framework (five I's); (iii) the key decision to create generic units/activities (that could be used with any existing curriculum/unit), as well as the subsequent decision to create grade-specific units each tied to a specific innovation theme; and (iv) the decision to create videos (first by TCs using simple editing software, and then by RHF professional videographers that visited a school site to document the E4I implementation).

One participant noted that the decision to create a separate, generic resource that reflected the Kindergarten (early learning) program represented "a key moment [with] significant effect on the direction of the project." The Project Leader highlighted a particular public event that helped the team to solidify their progress, and also mentioned the importance of the development of the generic resources and the establishment of the final version of the Innovation Cycle.

> Our celebration of March 24, 2017 was pivotal in helping us realize that we had a positive approach to the education resources and that our direction was sound. This celebration along with the generic resources, provided the foundation for our future work. Once we defined innovation and the phases in the process of the innovation cycle, we were able to continue to develop the learning experiences.

Various key moments and decisions, some made by RHF and others by the project Steering Committee, helped to shape the E4I process and related resources that were being developed. In the next two sub-sections, we will summarize the participant perceptions of both the positive and more challenging aspects of the process that they experienced over the course of the project.

Positive aspects. Participants were asked to reflect on the most positive aspects of the lengthy developmental process of the E4I resources. For example, one faculty member noted:

> The use of both onsite and online meetings for the planning team was good insofar as those involved were located at distance and so we benefited from both types of meetings. The fact that the original invitation to faculty was open to all was also nice to see, rather than only approaching a few select individuals—this ensured that those who took part were truly interested in becoming involved. The Project Leader provided incredible enthusiasm and organization throughout the project, even when many of the parameters were in flux. My own group of BEd students, and later on local teacher participants, were very interested in the books, the new curriculum, and the RHF videos/initiatives, as all of these represented a timely and popular subject (innovation) that was seen as contributing positively to their teaching practice. Funding for the project from RHF seemed realistic in terms of amounts, and verbal communication from RHF seemed highly supportive.

Another recalled how many different individuals were "invited to create, edit, review, rewrite, peruse the resources," leading to "lots of feedback from teachers." Another participant emphasized the positive aspect of the curriculum writing process vis-à-vis teacher candidates:

> Working directly with teacher candidates on the units provided me the opportunity to provide specific feedback and coach them through the curriculum development process. The teacher candidates

> expressed their gratitude to be able to work so closely with faculty on a curriculum development. They also appreciated the task was not for a mark, but for a long-term purpose. During the summer, we worked together with a team of teachers, teacher candidates, and faculty developing E4I resources. The opportunity to collaborate with different perspectives was enlightening and positive. Further, [Project Leader] is a highly organized leader … and was able to manage the many moving parts of the project simultaneously.

The Project Leader also provided insight into the perceived positive aspects of the Education for Innovation resource developmental process:

> Most importantly, the support of the Nipissing faculty team … has been invaluable to develop the vision, direction, and content of the education resources. Secondly, the engagement and excitement of our teacher candidates has been affirming. The support of the Rideau Hall Foundation has been ongoing and very helpful to narrow the scope and goals of the project. The enthusiasm of the co-authors of *Ingenious* and *Innovation Nation* have made the project worthwhile. Another benefit has been the opportunity to work with a school in [city]. This school has provided excellent feedback and input to the revisions, along with testimonials that have been very useful. Lastly, the teams of teachers using the resources have confirmed the value of our approach to innovation.

Many and varied were the apparent benefits of the various aspects of the large curriculum writing process. However, like with any complex project, certain elements were perceived as being somewhat challenging, and it is to these shared reflections that we now turn.

Challenging aspects. When asked about perceived recollections regarding the more difficult or frustrating parts of the project process, participants offered several specific insights.

The participant who was working on the Early Learning/Kindergarten resource noted that the "initial process of creating the first draft was daunting as the Kindergarten program is significantly different from other grades," and thus the "first attempt in the Kindergarten resource tried to follow the resource development rubric that other faculty were using for [the elementary level] units, [making it] very difficult." She then concluded, "Once the Kindergarten team was given the go ahead to create a resource that reflected that program, the writing was much easier."

One of the participants who was involved in the secondary school writing team felt that there was not adequate time to consult on the project, stating: "I'm not sure it really connects authentically to secondary school possibilities." The same participant also wondered if there were enough "recently experienced [secondary] classroom educators involved in creating this." Further,

> I don't think adapting an elementary program for secondary works. I think a whole rewrite with a focus on a particular program or course to start should have been done. I don't think the framework that was created is actually practical for all schools. You will only get schools with teachers willing to do this doing this … creating issues with equity.

The development of the E4I resources did primarily focus on the elementary level in its earlier stages, but this was more a function of the expertise and focus of the volunteer university faculty and writing team teachers.

Originally, the organizing body (RHF) had planned to send every Canadian school a copy of either the *Ingenious* or *Innovation Nation* books. When the decision was subsequently made to

not send printed copies of the books to every Canadian school primarily due to overall shipping costs, and to instead to focus on the online sharing of resources and targeted shipping to some schools, this was perceived as being somewhat problematic:

> Not having the *Ingenious* or *Innovation Nation* books available in the schools for teachers to use with the resources had a significant effect on the direction of the E4I resources…. Access to the [two] books was limited to a few schools who were directly involved in the project. On the one hand, we were directed to develop the resources with a focus on the *Ingenious* and *Innovation* books, but these resources (books) would not be available to all teachers. On the other hand, we could develop the E4I resources that include the books as a resource in the appendix instead of using them as a focus of the resources.

In her opinion, the "entire contents of the books should be on the website for teachers to access, as supplying every school/classroom with hard copies of the books is not practical." It should be noted that this issue was subsequently addressed, and all the innovation stories of the *Ingenious* book were posted on the CanadianInnovationSpace.ca site.

Another perceived issue shared by a participant involved the frequent changes in directives, as the project developed, that sometimes led to what felt like back-tracking:

> The changing and developing nature of the project sometimes made it difficult or challenging to know what was being expected by RHF, and then subsequently by our Project Leader, in terms of the resource creation. Clearer expectations around the scope and nature of the requested innovation units would have been helpful, for us and for our B.Ed. students, from the beginning, although this simply may not have been possible. That being said, the way it did play out may have ultimately led to better products in the end, as things were allowed to develop from the ground up, based on input, even if at times it felt like a moving target from the perspective of the volunteers involved.

On a similar note regarding the upside of inherent project flexibility, another participant noted: "This was a grass roots/organic approach to writing a very detailed and large resource" which "unfolded naturally and changed course continually through detailed and focused discussions." The same person asserted her conclusion: "All great work happens this way!"
A Steering Committee member touched upon the same issue of project guidance as follows:

> It was challenging to undertake this project as a creative endeavour without clear direction. I had to interpret the vision of the funders and collaboratively ideate this project. We were experiencing all the challenges of the innovation process as we had to inquire, ideate, incubate and implement to make an impact! … We could have had a better idea of the ultimate goal, and we could have scaled our project better with an implementation plan. We had some changes in direction but, ultimately, we did a great job of creating useful resources with little funding.

Finally, one participant questioned the effectiveness of the national partnership meetings, indicating that although it was a great initiative, the size of the expanded group became problematic. She noted specifically,

> On a couple occasions in the development process, the RHF arranged for a large group meeting. Although it was lovely to meet people from organizations across the country, I think the group was so large that little was accomplished…. The greater the number of people at the table from differing

> perspectives the more difficult [it was] to move things along. Also, it was not clear the role of the other organizations attending the meeting.

In the final subsection below, we will look at participant perceptions regarding possible future directions for the project resources and related events.

Future direction. Participants offered several suggestions regarding possible future directions for the *Education for Innovation* project. One key issue that was mentioned by almost all participants was that of knowledge mobilization, or the effective communication regarding the existence of, and access to, the created resources.

One participant noted that the RHF should heavily focus on good marketing and public relations strategies to broadcast the availability of the new website and related E4I resources. Another colleague similarly noted, "We need to determine a plan for implementing the resources which includes a media and distribution plan. We also need more feedback from users which could be solicited on the CIS website, and we need to name and frame this project with a consistent title and messaging."

Another faculty member shared their perceptions of the projected influence and impact of the resources, and also listed some perceived future challenges:

> I foresee that the revised generic and grade-specific E4I units will be of great usefulness to Canadian (and other) teachers, both by way of their direct implementation and also by way of serving as a guideline for how to approach creative, interdisciplinary curriculum design. The fact that these resources will be made available through a responsive, attractive, and interactive website platform (CIS) will likely make the public engagement even greater. Challenges for the initiative may include some of the following: (i) maintaining the national partnerships in terms of future communication and co-planning; (ii) deciding on how the E4I units will be accessed (D2L? PDFs? Other?); and (iii) how to best facilitate an exchange of teacher input/ideas along with student innovation samples by way of online/onsite, multi-media sharing of created products, processes, stories, and videos.

One colleague pointed out that there are many initiatives going on in schools presently, and that a lot of "work is being done in innovation out there." This individual was not sure if teachers would be willing to prioritize this particular resource over some of the other existing initiatives, such as Future Design School and Investigate! Invent! Innovate!™ (I3), created by the pan-Canadian organization, The Learning Partnership. Obviously, the extent to which the resources are promoted and presented will affect the nature of the teacher reception and the extent to which the units will actually be adopted in schools. In discussing potential impact of the E4I resources, one participant shared her thoughts:

> I think the resources have the potential to have a positive impact on students' development of an innovative mind-set in school communities. The whole school approach, that some schools have taken, is similar to the Teaching and Learning Critical Pathway (TLCP) initiative that was encouraged in Ontario schools around 2008. Alternatively, teachers are able to implement the E4I units/resources in their classroom—in every grade and subject.

Another challenge shared by a participant was the ability of teachers to integrate the E4I units with other existing provincial curriculum, a concern that was of course later addressed through the full development of the generic resources designed to be implemented, in whole or in part, with existing curriculum and (preferably) across the various disciplines via integration.

Discussion

In this section we will discuss the following four themes that emerged from the analysis of the Process Questionnaire data: (i) Innovation Journey Experience, (ii) Solid Leadership and Flexible Support, (iii) Iterative Mindsets, and (iv) Organic Organizational Structures.

Innovation Journey Experience

In reflecting on the overall E4I development and implementation process, a number of the core Steering Committee members were struck with how we were experiencing the various stages of our newly-devised Innovation Cycle (Figure 4) that was included within each of the units. We had definitely spent considerable time and energy in each of the non-linear stages of inquiry, ideation, incubation, and implementation—hoping and planning for a positive impact on the education system and a culture of innovation in Canada. Interestingly, the Developmental Evaluation model (Gamble, 2008), which informed our research, follows a similar approach to our E4I curriculum development. Gamble (2008) explains Developmental Evaluation as an "ongoing process of innovation in which both the path and the destination are evolving" (p. 15). What follows is a bulleted list of process activities that we, upon team reflection, have recorded as evidence of the Innovation Cycle components within our work:

Innovation journey: Inquiry phase.

- Impact was intended to be the cultivation of a culture of innovation among Canadian youth using inspirational stories from *Ingenious* and *Innovation Nation* books written by The Right Honourable David Johnston, 28th Governor General of Canada and Tom Jenkins.
- Education Committee was formed by Rideau Hall Foundation (RHF) and members explored the concept of innovation and related resources/literature.
- Faculty Innovation Team was formed through an initial call for voluntary participation from within the Schulich School of Education at Nipissing University. A committee of seven representatives of national Education Partners was formed by RHF, each involving some connection to innovation-related programs, and each being consulted in the Inquiry phase.

Innovation journey: Ideation phase.

- Discussed the developmental process of the resources.
- Determined that teacher candidates would be asked to write Innovation Units in teams.
- Created a template for unit planning with an Innovation Project as the culminating activity.
- Developed Innovation Units using stories from *Ingenious* and *Innovation Nation*, as aligned with the *Ontario Curriculum*.
- Presented the units to The Right Honourable David Johnston, 28th Governor General of Canada and the Rideau Hall Education Committee.
- Used teachers in schools to provide ongoing feedback on draft materials to determine impact.

Innovation journey: Incubation phase.

- Pilot Teachers were given opportunities to experiment with ideas from the E4I resource and related children's literature.

- Teachers adopted various iterations of the resources.
- Schools included an innovation focus in assemblies and school-wide celebrations.
- Educators provided ongoing feedback on the E4I resources.
- The first editions of the resources were posted in Fall 2017.
- The second editions of resources were posted in Fall 2018.
- Videos and supporting materials were developed, as necessary.

Innovation journey: Implementation phase.

- The website *CanadianInnovationSpace.ca* is launched which has testimonials, activities, photos, curriculum units, and guidelines on how to promote a culture of innovation.
- Two videos were developed to showcase the work of a pilot school [John Sweeney].
- Resources were shared in conferences across Canada in Ontario, Alberta, British Columbia, New Brunswick, Saskatchewan, and Nova Scotia.
- Sessions have been presented in Greece , the United States, and Norway.
- Partnerships have leveraged opportunities with youth in entrepreneurship programs such as Junior Achievement (JA) Canada .
- Future outreach plans include professional meetings, the increased use of social media, and rich networking opportunities.
- Innovation journey: Impact phase.
- The research study results from both the product and process questionnaires begin to provide us with some indication of perceived impact with students and teachers.
- The full story of a successful implementation of the E4I resources in one particular elementary school in southern Ontario, John Sweeney Catholic School, is captured in both film (video documentary) and print (Cantalini-Williams, Black, Jarvis, & Guibert, 2018, Fall).

Solid Leadership and Flexible Support

It was evident from the findings and the literature (Myers & Schenkman, 2017) that enthusiastic and committed leadership was pivotal to the success of the developmental process. The passion of the co-authors of the books *Ingenious* and *Innovation Nation* was a driving force for the project. They had a clear vision of cultivating a culture of innovation among Canadian youth through the contents of their books which was translated into the development of teaching resources. Similar to curriculum development projects found in the literature (Bordage & Harris, 2011; Bryman, 2007; Hurlimann et al., 2013), the dedication of the Project Leader was continuous and sustained throughout the project, as indicated by the continuity of task assignment and completion, along with the public celebrations of the project's achievements.

Leadership from the Rideau Hall Foundation was clearly provided in the early summer of 2017 when a Manager of Innovation was assigned to the E4I project. Myers and Schenkman (2017) concluded that developing collaborative partnerships was critical to the success of

curriculum development projects. Similarly, the innovation team of RHF was very supportive of the project and yet were flexible in adjusting timelines and expectations in relation to resources and funding. The ongoing meetings between the Manager of Innovation and the Project Leader were very helpful to maintain the momentum of the project. In alignment with Sidebotham, Walters, Chipperfield, and Gamble (2017), our collaborative curriculum development process could be described as "focused on partnership in action" (p. 9). The support of the Nipissing University faculty team was unwavering as they met regularly in spite of long distances between members and very busy schedules. Their support included working with teachers and teacher candidates, presenting at local meetings and international conferences, summer writing teams, reviewing manuscripts, and developing the research study. To move away from the top-down approach, the literature review (Bakah, Voogt, & Pieters, 2012; Fullan & Hargreaves, 1992) highlighted the need for teachers to have ownership of the curriculum development process. As suggested by Huizinga et al. (2014), teachers were engaged and supported at all stages of E4I curriculum development. Similarly, teacher candidates were involved in the curriculum making process. We concur with Lambert and Biddulph (2015) that engaging teacher candidates in participatory curriculum development can enhance their learning experience. In agreement with Lambert and Biddulph (2015), teacher candidate engagement with meaningful curriculum development needs to be further explored.

Iterative Mindsets

As we have already seen in section 4.1, the overall developmental process of the participatory curriculum development involved iterative elements that would be closely mirrored within the Innovation Cycle Model (see Figure 8) that was created and revised multiple times for ultimate inclusion in the resource documents. Supportive educational philosophies at all stages of curriculum development are highlighted in the literature (Buell Hart, 1986; Lillevang, Bugge, Beck, Joose-Rethans, & Rignsted, 2009; McFadden & Roehrig, 2017; Robertson, 2007; Rosy, 2015). Participants in the process questionnaire clearly indicated that the ability to conceive of such a required model, to work with the project organizers (RHF) in fine-tuning its graphical representation, and to observe teacher participants absorb and apply this new model in their classrooms all contributed to a positive sense of iterative cycle development. Such a mindset, both flexible and critical in nature, was evidenced in the core Steering Committee's desire to continually re-define key aspects of the curriculum resources (e.g., the focus on generic activities/lessons, the Innovation Model and sub-components, the branding).

Organic Organizational Structures

The Project Leader was able to guide this complex initiative with flexibility through its various stages, buoyed by a supportive funding organization, and encouraged by a core team of dedicated faculty members and teacher volunteers. The organization of large and small groups of stakeholders, taking place throughout various seasons of the calendar year and working on various aspects of the process, allowed the core Steering Committee to draw upon existing professional relationships as well as establish new connections with interested participants. Consistent with the literature (Bhat, Pushpalatha, & Kulkarni, 2017; Hurlimann et al., 2013), time was an inhibitor to the developmental process. Nevertheless, throughout the various developmental stages, time was made to include face-to-face meetings and curriculum writing

and revision sessions, as well as many virtual planning meetings that were hosted throughout the years as needed.

The development of the national partnership idea provided additional insight and a broader vision of how such an innovation curriculum may align with, and echo pre-existing initiatives across the country. Input gained from the face-to-face meetings with these various stakeholders encouraged an enlarged awareness of contemporary events, resources, and links.

Study Limitations and Future Research Directions

This research study featured the participation of 24 teachers in the Product survey, and 6 faculty and teacher participants in the Process survey. Thus, increased numbers of participants would have made the latter study more interesting and fulsome. We concur with Carse's (2015) recommendation for longer term engagement, reflection, and professional dialogue relating to curriculum development and implementation. Future direction might include research conducted surrounding the long-term implementation and impact of the E4I resources in diverse Canadian schools. We are hopeful that this paper will provide some direction to future curriculum writing teams tasked with similarly large and comprehensive projects involving many stakeholders.

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Appendix A: E4I Process Questionnaire

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 Questionnaire

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?