

Developing Leadership Capacity Through Entrepreneurial Programming

McMaster University

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Abstract

Leadership skills are an essential part of driving innovation in an organization. Described is a teaching and learning framework in which thinking and doing skills for innovation are used as a context for developing student leadership and personal character development.

Program Description

The Masters of Engineering Entrepreneurship and Innovation (MEEI) program launched at McMaster University in 2005. The program was a response to a national call to action, elicited from the efforts of a national innovation council¹ to support the development of a national innovation strategy. McMaster University took a leading role in the development of entrepreneurial programming at the graduate level by engaging players from industry to create the program curriculum. These industry players began designing the program in 2003/04. Through industry councils and associations, a wide swath of innovation leaders in Canada were consulted with respect to the program design during 2004/05. Funding donations from industry were essential in the early support and development of the program.

This program used an experiential approach to technology entrepreneurship by having student teams create a real technology-based business as a part of their Master degree. The program was unique in that it was designed to create new business using a phase and gate² approach. In such an approach, new business creation projects are de-risked by evolving the understanding of the new business idea in the form of specific content delivered to an assessment group at the 'Gates' in the process. The technology that forms the basis of the new business idea must be assessed in the context of the elements of a business. This content is commonly referred to as a 'Gate Deliverable' and the assessment of the Gate Deliverables at each stage determines whether the project should proceed, be re-worked, or be abandoned.

¹ Response to The Government of Canada's Innovation Strategy, The Innovation Council, Conference Board of Canada, David K. Potter - Chair, 2002.

² R. Loutfy & L. Belkhir, Research Technology Management, Washington, 44(4), p.15, 2001

Gate deliverables and the knowledge and skills needed to achieve them were built into program courses and project work. The project work to create a new business was evaluated at the process gate reviews. The gate reviews were carried out by practitioners from industry, as well as faculty members. These assessments were team based and independent of coursework assessments. Graduation from the program required the student to successfully complete the requisite courses, as well as all of the team-based project gate reviews. The schedule for the MEEI program project process and associated courses is laid out schematically in Figure 1.

Of particular interest in this description of teaching and learning to build Innovation capacity is the relationship to the student's development of leadership skills and character. This element is often overlooked or taken for granted in most entrepreneurship educational programs, which tend to focus on the process elements.

During the first few years of the program, the development of engineering leadership skills by engineering students in the program was observed but was not formally addressed in the program. After further consultation with industry leaders in a series of five focus groups in 2014, a formal leadership development component was added to the curriculum. The addition consisted of a formal course delivered at the start of the program. The content delivered in this course was practiced by students in the course, but more importantly, during the work in teams to develop their technology-based new business idea.

The program was eventually housed in what became the W Booth School of Engineering Practice and Technology at McMaster University. The School also housed graduate level programming in engineering design and engineering and public policy. Leadership programming was developed in the context of all three programs and evolved to use the program elements of each as a context for leadership development. This resulted in an "experiential teaching and learning framework to build innovation capacity", which is depicted in Figure 2. The MEEI program in the School consists of a series of nine "courses" that address the following three categories:

1. Innovation Process Frameworks
2. Thinking and Doing Skills for Innovation
3. Leadership and Personal Character Development

The entrepreneurship program described here was a full time graduate program that culminated in the achievement of a MEEI degree. The program could be completed in 24 months. The entrepreneurship program attracted approximately between 15 to 25 students per year from 2005 to 2020. The students were from a mix of education levels. Most of the students were admitted to the program directly from a Bachelors of Engineering degree,

although some students came from industry and were even supported by their employer. There were also students admitted to the program with Bachelor, Master, or Doctoral degrees from other STEM programs. A large portion of the students in the program were international students (~80%)

Connecting Themes

Engineers that drive innovation are expressing EL in that they are taking responsibility for the integration of technology into society. This leadership includes the skills needed to navigate the evolution of the technology to serve society as well as the responsibility for safeguarding the effects of the technology on society. The skills needed to develop leaders that have the capacity to drive innovation in an organization can be broadly categorized into three types: Innovation Process Knowledge, Thinking and Doing Skills for Innovation and Leadership Personal Character Development. This thematic framework for the innovation teaching and learning process is discussed below and the skills developed are detailed in Appendix A.

1. Innovation Process Knowledge: the application of knowledge relevant to the process of innovation. This knowledge includes an understanding of the innovation process, the art of framing a problem to be solved³, the identification of added value, the detail and mechanics of building a business case, and an understanding of the ambiguity and conceptual dynamics of evolving a business concept.
2. Thinking and Doing Skills for Innovation: the personal skills needed to effectively function in an innovation context. The skills include the ability to work with incomplete information and ambiguity, the creativity skills to engage effectively in value creation, and team skills for effective collaboration.
3. Leadership and Personal Character Development: the personal and interpersonal skills needed to effectively negotiate the cultural and social interactions that facilitate an effective innovation process with relevant stakeholders within, and external to, the organization.

In each of these categories, it is possible to communicate relevant knowledge in a codified form, such as a written document, a presentation, or a video. This communication will familiarize the student with the relevant subject matter but will not develop a level of functional expertise. Functional expertise is developed when the subject matter is experienced through practice. For example, the student might conceptually understand the process of collecting stakeholder input that is typical of a design thinking process, but might be unable to recognize the salient observations needed for problem definition without the experience that practice brings.

³ Belkhir, L., Fleisig, R., and Potter, D.K., "Effective Learning of Innovation by Engineering Students in a Multi-disciplinary Context", *International Journal of Engineering Education*, Vol. 34, No. 4, pp. 1223-1235, 2018.

Instructional Strategies and Teamwork

The educational framework depicted in **Figure 2** attempts to express the development and learning relationships between three key elements of an experiential learning framework that evolved in the W Booth School at McMaster University. The three key elements include The Innovation Studio, the Leadership for Innovation course, and the bulk of the Entrepreneurship program which consists of the Enterprise Project Process (this is the new business creation project process) and associated courses.

As can be seen in Figure 1, the Enterprise Project process and associated courses provide Innovation Process Knowledge. This process makes up the bulk of the curricular programming. The Innovation Studio⁴ provides the bulk of the Thinking and Doing Skills for Innovation, delivered in a design thinking context. The Leadership for Innovation course provides students with awareness and experiential opportunities to build leadership skills and character. The relationship between these elements is meant to represent a cascade of learning and development opportunities to build and reinforce student learning and development. To be clear, although there is opportunity to practice skills in the Leadership for Innovation course, the bulk of practice will occur in the Innovation Studio and in the Innovation Process Knowledge curricula. The Leadership course and the Innovation Studio are delivered, primarily in the first months of the programming, whereas the Innovation Process Knowledge element runs the length of the students' program in the School.

Student leadership development begins in the Leadership for Innovation course and includes 'Personal Leadership Skills', 'Interpersonal Leadership Skills', and 'Organizational Leadership Skills' (as described in Appendix A). Workshopping activities explore some of the tools that are typical in a high innovation performance organization⁵, as well as the nature of leadership in an innovation context as it relates to the management of change. These activities are designed to illustrate the importance of the organizational elements to the innovation process, as well as the contribution of the innovation process to outputs to other processes such as corporate social responsibility.

All of the project work in the program involves work in teams. This teamwork starts at the Innovation Studio where project ideas are conceived in transient teams and progresses to the formation of a more permanent team as the project idea crystallizes to become a new business creation idea. Students are not permitted to pursue a project unless they are part of a team. Potential projects that do not draw enough interest to engage a team are abandoned.

⁴ Dodd, M., Conder, J., Potter, D.K., Allen, R., Bawa, S., and Fleisig, R., "Design and Development of an Interdisciplinary Graduate Program in Engineering Practice", Proc. 2016 Canadian Engineering Education Association Conf., CEEA16; Paper 20, Dalhousie University, Halifax, June 19-22, 2016.

⁵ Colcleugh, D., "Everyone a Leader: A Guide to Leading High Performance Organizations for Engineers and Scientists", University of Toronto Press, 2013.

Equity, Diversity, and Inclusion (EDI)

Equity, Diversity, and Inclusivity is inherently built into the leadership programming through the work to develop interpersonal leadership skills described above. The development of empathic listening, effective communication, and behaviours that support trust development require the internalization of EDI concepts.

Our Impact

Routine program assessment relies on the usual course based assessments and student input has tended to be quite favourable over the years. Student input is also sought in the form of a program evaluation session that takes place at some key milestones in the program. For example, an hour of the Innovation Studio time is devoted to seeking input from students with respect to the programming and its delivery.

The external impact of the program is reflected in the many students that have been successful at either the creation of their own business, or in their ability to achieve employment at the management level of a wide range of diverse organizations.

Next Steps

The W Booth School indicates that the MEEI program is temporarily not receiving applications (December 2023). This situation is likely to continue until the School is able to source a faculty champion(s). Finding faculty members with the requisite skill set at the intersection of business and technology while satisfying the academic ranking requirements of a university is difficult.

Recommended Reading

The description presented here is supported by a detailed white paper that describes the program philosophy, structure and key learning elements. The interested reader can find at [White paper - Building Innovation Capacity Through Entrepreneurship Educational Programs](#) .

Figure 1

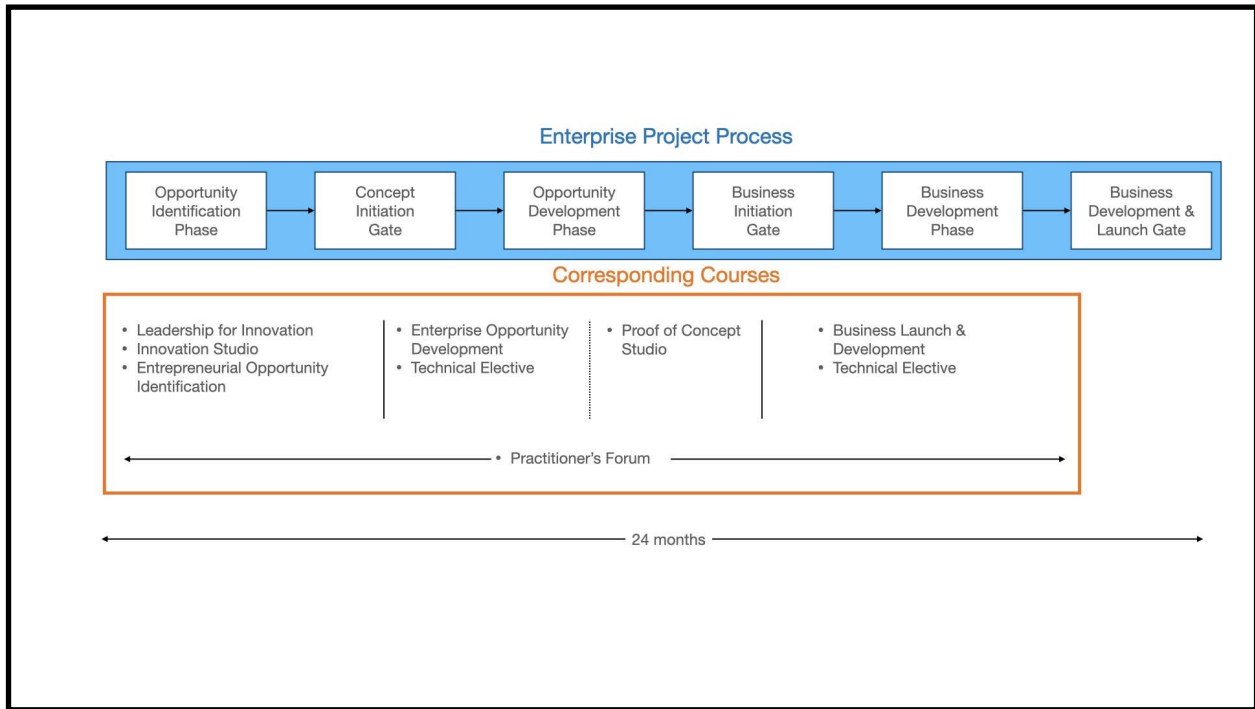


Figure 1: Schematic of the schedule of the MEEI Enterprise Project process and corresponding courses.

Figure 2

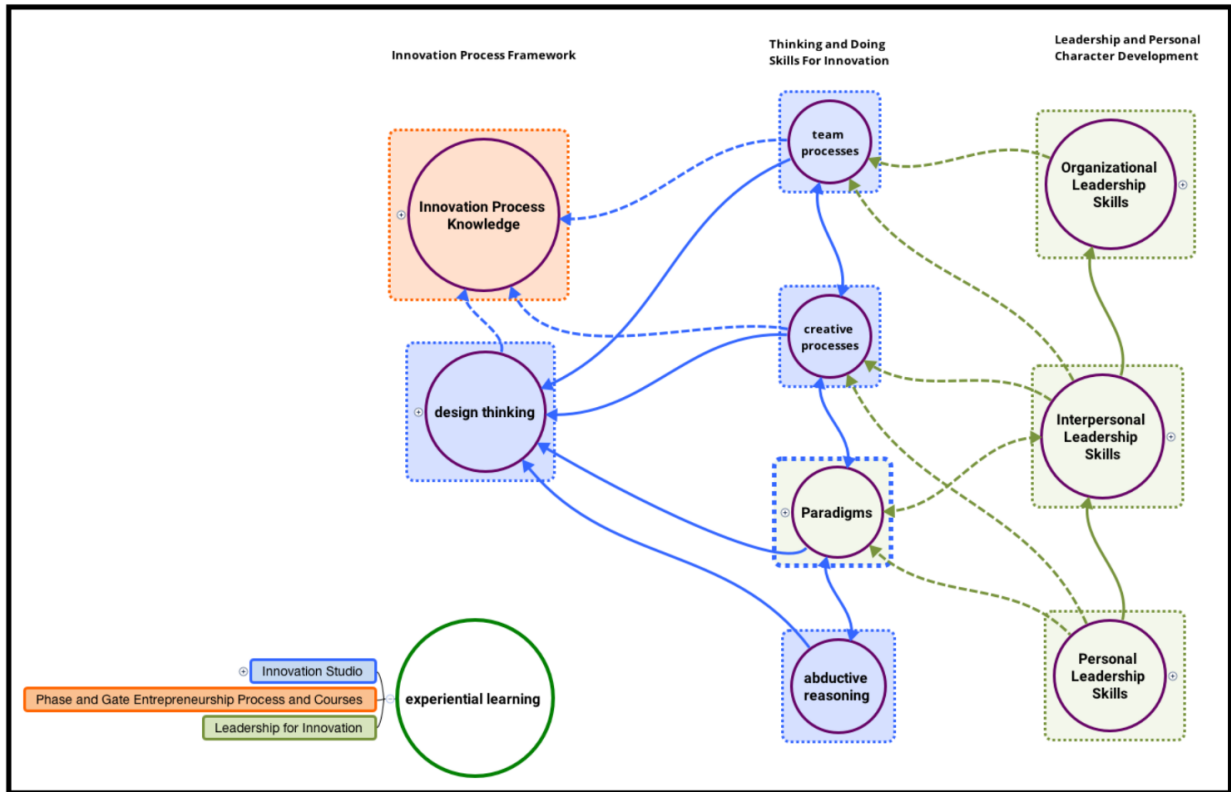


Figure 2: An experiential teaching and learning framework to build innovation capacity.

Appendix A - Personal, Interpersonal, and Organizational Leadership Skill Development Summary

Personal Leadership Skills (Managing One's Self)

The development of personal leadership skills encompasses:

1. An understanding of paradigms and the development of self awareness with respect to one's own personally held paradigms.
 - Embracing the perspective of others, understanding multiple, sometimes conflicting, viewpoints of stakeholders around an issue or problem.
 - self awareness of the limitations and ambiguities of one's own limits to understanding and interpretation.
 - openness to undertake a comparison of different mental models and alternative perspectives.

2. An appreciation for proactivity and taking initiative.
 - The experience of making paradigm choices, in a behavioural context, is a convenient lead-in to the concept of proactivity.
 - As defined by Stephen Covey⁶, proactivity is about understanding and using the ability to choose.
 - Choosing to take initiative is also critical to personal development in general.

3. Acceptance of personal creativity and the work to develop it.
 - Taking the initiative to enhance one's personal creativity
 - deliberately placing oneself in situations that are outside of one's everyday experience (sometimes referred to as 'getting outside of your comfort zone') which allows for observations and experiences that are new and may challenge personal paradigms.
 - Skills of observation and the flexibility and mental gymnastics needed to grapple with internalizing such experiences and observations.

Interpersonal Leadership Skills (Interacting With Others)

Interpersonal leadership skills that are relevant to innovation performance are a focus. These include:

⁶ Covey, S.R., "The 7 Habits of Highly Effective People, Free Press, New York, 2004.

- Innovation processes are team based and rely on successful team performance.
- Interpersonal skills that promote relationships are critical to effective team performance.
- understanding of how individual behaviour contributes to trust building
- Empathic listening is developed through practice and are practiced in a 'safe' environment
- Expressing oneself effectively is just as important in a team environment as is building the self confidence, opportunity, or skill in negotiating the team dynamic.
- Problem focused conflict resolution as opposed to a focus on personalities.
- Learning conflict resolution is enhanced by initially practicing role play followed by reflection. Respect for individuals, trust building, integrity, and honesty are conceptually easy to understand, but recognizing how these elements translate into practice is best achieved through experience.

Organizational Leadership Skills (Deliberate Team and Organizational Processes)

The word 'organizational' here refers to groups of people in a purpose driven interaction. The simplest version of this is the project team. Also considered here with respect to the innovation process are some of the complexities of larger collection of people that might be organized in the familiar departments or functions of a large corporation, or some of the other emerging organizational types, such as the decentralized team model.

- Skill development that falls under this topic is intended to support new business creation within the context of the program, while developing skills that are transferable to the innovation work environment of a large organization. Some of the topics covered here include:
 - Team formation process
 - Development of team facilitation skills
 - organizational paradigms associated with leadership style archetypes⁷
 - Personal behaviours associated with different leadership styles
 - Different organizational cultures and the impact of culture on the innovation process.

⁷ Laloux, F., "Reinventing Organizations", Nelson Parker, 2014.