

How Canadian Universities Align Their Curricular and Co-curricular Programs with Institutional Culture and Entrepreneurial Ambitions

Prof. Tate Cao, University of Saskatchewan

Dr. Shaobo Huang, University of Saskatchewan

Dr. Shaobo Huang received a Ph.D. degree in Engineering Education from Utah State University. She has over eight years of teaching and/or research experience in engineering education. She is currently an Assistant Professor in the Ron and Jane Graham School of Professional Development with a joint appointment in the Department of Mechanical Engineering at the University of Saskatchewan in Canada. Dr. Huang is one of the key leaders in the RE-ENGINEERED First-Year Program at the University of Saskatchewan.

A New Framework on How Canadian Universities Align their Curricular and Co-curricular Programs with Institutional Culture and Entrepreneurial Ambitions

Ning Tate Cao, Shaobo Huang

Ron and Jane Graham School of Professional Development
College of Engineering
University of Saskatchewan

Abstract

The Canadian economy currently ranks as the 9th largest in the world in terms of GDP. As technology-driven entrepreneurship becomes increasingly important for creating jobs and wealth and for gaining a competitive advantage on a national level, both engineering students and innovative employers are demanding more exposure to and training in innovation and entrepreneurship. Universities must respond to these growing demands in creative ways, but there is currently a lack of standardization in the design and delivery of entrepreneurship education programs, making it difficult for educators and public funders to compare programs across institutions. Furthermore, each school has a unique institutional culture and entrepreneurial ambition that may shape its definition of entrepreneurship education and its approach to program design. Some programs may focus on design, others on sustainability, and still others on the scalability of firms.

To address these challenges, the authors of this work propose a framework for aligning institutional culture and entrepreneurial ambitions with program design. The process of constructive alignment will provide a better understanding of the current practices in engineering entrepreneurship education and bring clarity to the diverse approaches used in pedagogy. By developing a standardized framework, educators and funders will be better equipped to evaluate and compare different programs, ultimately leading to improved outcomes for both students and educators.

Keywords:

Entrepreneurship, Innovation, Canadian Education, Program Design, Constructive Alignment

1. Introduction:

Currently, the Canadian economy is the 9th largest economy in the world in terms of GDP [1] [2]. However, real GDP growth in Canada has been staggering. Canada is currently investing in entrepreneurial activities to boost its economy in the coming decade. The Government of Canada has established entrepreneurship as its main priority. Canada has been on a mission to promote research and development (R&D) within the higher education sector with the aim of increasing the production of new knowledge and attracting and retaining world-class researchers [2]. Canada has reported a strong and stable state of entrepreneurship compared to other countries in the world [3]; however, there is a call for an increase in entrepreneurship education in Canada as it drives economic growth, increases performance and productivity, and creates jobs [2].

The Government of Canada surveyed Canadian universities and colleges to establish a framework for the delivery of entrepreneurship education. A total of 36 universities and 32 colleges responded, representing 33 percent of the overall pool and more than 60 percent of the total undergraduate population in Canada between 2007 and 2008. The survey found that around 40 percent of the institutions surveyed did not have a strategy for their entrepreneurship education, and only a limited number of students had access to entrepreneurship education. Moreover, only 28 percent of the institutions had the objective of delivering entrepreneurship education to all faculties. These statistics, coupled with a low level of entrepreneurial linkages to outside educational institutes, exacerbated the issue. Most of the entrepreneurship education material was offered to business and engineering students, while over 40 percent of the institutions did not have external links to investors [2].

A recent review of the top 27 universities in Canada, based on student enrollment, showed a dramatic increase in the number of courses and programs offered across various faculties and levels of study. On average, 22 courses were offered across various Canadian universities, a significant increase compared to an average of one to five in 2010 [1]. The majority of universities (21/27) offer incubator services, with an average of 3.3 incubators and accelerators per institution. Additionally, student clubs, co-op programs, and external support have significantly increased in recent years [4]. These improvements demonstrate progress in meeting the demand for entrepreneurship education and the goals set by the government and educational institutes. However, more work needs to be done to understand how these programs are being delivered and utilized.

A more detailed analysis was conducted in 2020 on seven Canadian universities to demonstrate the different practices of entrepreneurship education. The paper identified a gap in entrepreneurship education in Canada and demonstrated a need for follow-up studies with a more holistic view of entrepreneurial teaching among all Canadian post-secondary institutes. Additionally, the focus of entrepreneurship education has developed beyond creating a business towards building entrepreneurial skills and business planning [5]. Therefore, there is a need to review fields closely tied to entrepreneurship, such as leadership and innovation as well. Furthermore, a more holistic review is needed to examine various aspects of entrepreneurship education beyond the delivery of courses, but with the inclusion of teaching methods, extracurricular activities, and curriculum design.

More work is being done in the field of entrepreneurship in Canada, with the development of courses that focus on specific aspects of entrepreneurship beyond technical skills. Entrepreneurship education also now focuses on equity, diversity and inclusion (EDI). For example, as part of these new initiatives, the Black Entrepreneurship Program [6], the Aboriginal Entrepreneur Program [4], and the Young Entrepreneurs program [7] have been launched.

Constructive Alignment

Constructive alignment is a well-known tool used to guide the outcomes-based curriculum design process [8], [9]. First proposed by Biggs in 1996, the model of constructive alignment contains three cornerstones, including intended learning outcomes, teaching and learning activities

designed to elicit these outcomes, and targeted methods for assessing how well students achieve these outcomes (see Figure 1). This model can be very helpful in shifting from teaching-centric instruction towards learning-centric instruction.

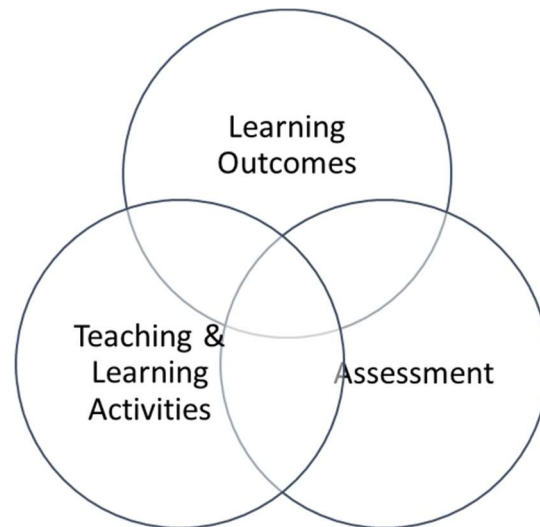


Figure 1 Biggs Constructive Alignment Model,

In this paper, the authors attempted to investigate current engineering entrepreneurship education through the lens of Constructive Alignment. We want to understand if this framework can capture the nuts and bolts of the abovementioned diverse entrepreneurship education program designs. The authors proposed a modified model for the existing constructive alignment model to reflect the feedback we received from the field.

2. Methodology

2.1 Data Source

To obtain a comprehensive view of Canadian entrepreneurship education, we accessed the list of designated educational institutions from the Canadian Federal government's web tool provided by Employment and Social Development Canada. We limited the scope of the project to educational institutions with the status of "university" only; regional colleges were not included in this scan. This list included 96 universities from ten (10) Canadian provinces. HEC Montreal was analyzed as a department of the Université de Montréal, and École de Technologie supérieure is assigned to Université du Québec. Since programs from HEC Montreal were found on the official websites of the Université de Montréal, we included them in our analysis, as we did with École de Technologie supérieure.

2.2 Program Information

We focused mainly on education programs related to entrepreneurship, innovation, and leadership in Canada, including certain management and commerce programs with these characteristics. To do so, we searched each university's catalog using keywords such as "*entrepreneurship*", "*innovation*", "*leadership*", and "*management*". All corresponding program information was found on the universities' official websites. The programs were classified into seven types:

certificates, bachelor's degrees, master's degrees, MBA degrees, Ph.D. degrees, diplomas, and short programs.

To be more specific, the classification followed the following rules: (1) minors were recorded as certificates; (2) honours degrees were recorded as certificates; (3) option programs that allow students to specialize in entrepreneurship, innovation, and leadership were recorded as certificates; (4) different levels of diplomas were analyzed as a whole; and (5) short programs mainly refer to projects without credit requirements and are mostly seminars and lectures.

We collected qualitative and quantitative information for each program identified. For the qualitative analysis, we recorded the corresponding host university and college, degree type, major (if applicable), program information and focus, and curriculum for further analysis. Additionally, we standardized the number of courses and credits. This approach enabled us to analyze all programs using the same criteria.

2.3 Follow up Interviews

To better understand education practices, we identified the top 20 universities on the most innovative ranking, Canada's Best Universities by Reputation 2022, issued by Maclean's [10], 2021). These 20 universities offer a total of 104 programs. We conducted structured interviews with the managers of entrepreneurship programs at four universities, including the University of Waterloo, York University, the University of Toronto, and Victoria University. Our interviews aimed to define success and understand crucial activities, infrastructure, and challenges towards success.

A total of 15 questions were discussed during each interview, with four questions asked about general information about their entrepreneurship program, such as the scope and enrollment of the program. Two questions focused on the definition of a successful program, three about the support and challenges, one about the impact of the program, three on program/curriculum integration, and one on future improvement.

3. Results

3.1 Program Information

A total of 245 programs were identified from 65 out of the 96 universities. In thirty-one universities, we could not identify any information on entrepreneurship, innovation, and leadership-related programs. The results are shown in Figure 2. The number of bachelor's and master's programs is similar: 49 undergraduate programs, accounting for 20.00% of the total; 47 graduate programs, accounting for 19.18% of the total. In addition, 11 Ph.D. and 11 MBA programs were included, accounting for 4.49% of the total. Certificate programs were the most numerous, with 99 programs accounting for two-fifths of the total. There were 21 diploma programs in total, and 7 non-credit short-term programs were collected.

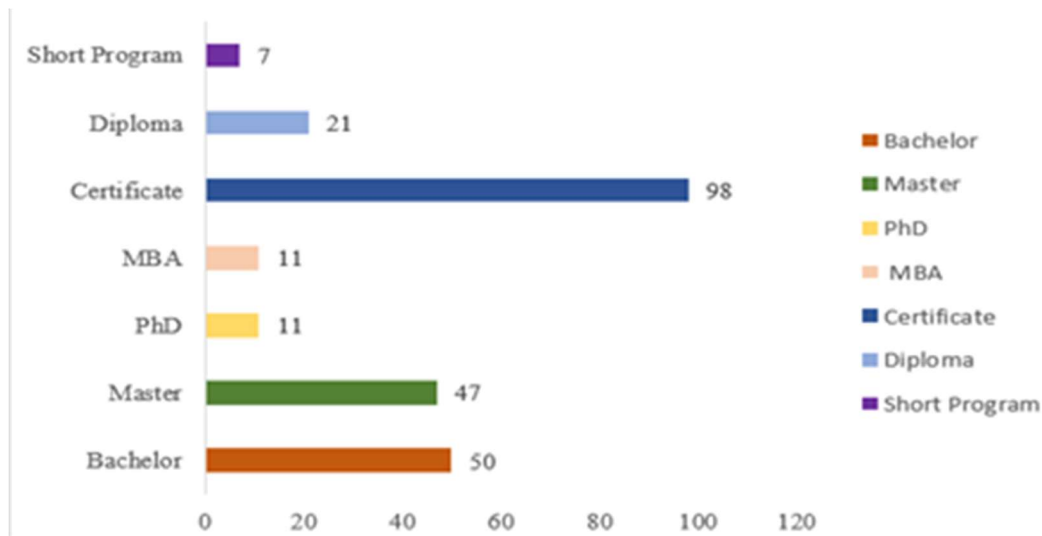


Figure 2 The Number of Programs in All Categories.

3.2 Interview Results

Qualitative data about the programs were collected via the interview. We attempted to analyze the features of the programs by following the constructive alignment model developed by Biggs [8]. More specifically, we discussed the key features of the programs in terms of their program outcomes, assessment, and teaching activities in the paragraphs below.

Learning Outcomes: All programs aim to facilitate students in gaining entrepreneurship skills. However, different emphases in desired outcomes were observed among the four programs. The programs at the University of Toronto and the University of Waterloo aimed to expose more students to entrepreneurship skills, while the programs at York University and Victoria University focused on completing the certificate/degree requirements. Although program desired outcomes do not align precisely with the typical learning outcomes of a course as defined in the Bigg's constructive alignment module, they play similar roles as learning outcomes in determining the appropriate measurements of program success and guiding the program design to achieve the success. We categorized the desired outcomes as learning outcomes in our analysis.

Assessment: All programs, except for the one at the University of Waterloo, assessed student satisfaction and mindset to evaluate how well they had achieved the program outcomes. The program at the University of Waterloo involved students in a deep reflective cycle and did weekly reflections in the courses.

Teaching & Learning Activities: The program at the University of Toronto had three foci: ideation, venture, and indigenous entrepreneurship. The program was open to all students in engineering and business majors as well as alumni in the community. It provided workspaces to student groups and placed students with startups under the support of mentors. The University of Waterloo provided undergraduate elective courses for students from first to fourth year on business, entrepreneurship, and technology to encourage new venture creation. An incubator model was applied to provide student entrepreneurs co-op experience over four months in the summer. Both

programs at Victoria University and York University offered a certificate/minor in entrepreneurship to undergraduate students. The program at Victoria University also offered an MBA entrepreneurship specialization, and the York university was expanding their program to graduate the community.

Besides the primary teaching activities, each program also implemented various activities to enhance student learning experiences, such as workshops, seminars, hackathons, pitch competition, field trips, conferences, and/or entrepreneurship council. They were not necessarily teaching activities, but they were important components that influence the program outcomes.

We also noticed that the program activities resulted in different cultures. For example, the University of Toronto had a culture to improve social welfare, the University of Waterloo and Victoria University emphasized a creative and innovative culture, and York University focused on entrepreneurial mindset in the core curriculum for undergraduate engineering and computer science students. The program culture aspect does not fit well in the current constructive alignment model; however, it is an important element that can potentially influence the learning outcomes and program design as identified by the educators.

4. Discussion

Entrepreneurship education is expanding in Canada, with over 245 programs identified from 65 universities. On average, each university offers four different programs, demonstrating the diversity and complexity of entrepreneurship program offerings. While these offerings are not limited to the college of engineering, they provide multiple pathways for students, even those in engineering, to learn entrepreneurial knowledge and skills.

To further complicate matters, all four universities that were interviewed offer more than academic curriculum-based programs to students. Co-curricular and extracurricular activities, such as hackathons, workshops, and seminars, were identified as important parts of the program offerings for program success. These programs are crucial, yet they do not fit into the current model of constructive alignment. Another factor not included in the traditional constructive alignment model is the program culture.

A Modified Constructive Alignment Model

Biggs, Kember, and Leung (2001) proposed the Presage-Process-Product (3P) model to describe the interactions among various factors and how they form a dynamic system of teaching and learning. Presage factors referred to the existing personal factors (such as prior knowledge, learning preferences, and personality) and situational factors (such as the nature of the content, teaching and assessment methods, and institutional climate and procedures) before individuals engage in a learning activity [11], [12]. Process factors referred to the students' approaches to learning, including intrinsic/extrinsic motives and learning strategies [11]; while the Product factors were defined as the learning outcomes [12].

Jain et al. (2016) further modified the constructive alignment model by highlighting the importance of presage and process factors [13]. As shown in Figure 3, the modified model also involved facilitation as a key element that influences learning outcomes during the process of learning. More

specifically, in the context of entrepreneurship education, it is important to create a positive entrepreneurial culture. After all, "culture eats strategy for breakfast," according to the pioneer of entrepreneurship education, Peter Drucker [14]. The other important distinction is the types of teaching and learning activities. In the model proposed by Jain, it is important to differentiate between instructional design and facilitation. While instructional design focuses on the hierarchy of skills based on Bloom's taxonomy in the program, course, and activity design, facilitation focuses on the specific approach to support key learning outcomes, such as reading, reflection, research, and collaborative learning.

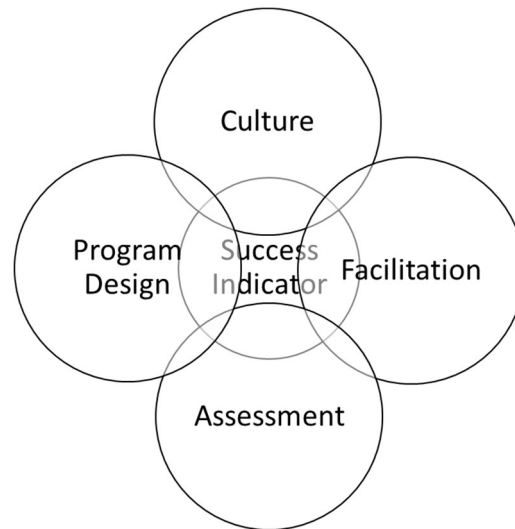


Figure 3 Modified Constructive Alignment Model based on Jain et al.

In this paper, we define the constructive alignment process to include the following five components: success indicators (desired outcomes), entrepreneurial learning culture, program design, facilitation, and assessments.

Success Indicators – The desired outcomes of the program. These outcomes may include knowledge, skills, attitudes, as well as the ability to learn. However, the interview results revealed that programs may not solely focus on the specific category of knowledge, disciplinary skills and attitudes. Instructors had identified desired outcomes such as exposures to the concept of entrepreneurship and completion of certificates. It might be because that entrepreneurship education is an emerging discipline, the learning outcomes are difficult to define and quantify given the current state of entrepreneurship education research. The result brought an interesting finding. It provides a new insight that maybe the success of entrepreneurship education should be measured as process factor rather than product factor. More specifically, it may be appropriate to measure the progress and achievement of learners on the journey of entrepreneurship rather than the absolute learning outcomes based on performance. Nonetheless, it is important for future work to clarify the success indicators in order to develop strong metrics of success.

Entrepreneurial Learning Culture – An entrepreneurial learning culture is a holistic incorporation of the students' and instructors' values, beliefs, and social conventions to enhance

the acquisition of knowledge, competence, and performance. It may include students' growth mindset, passion, peer support, and mentoring. The culture may include methodologies for creating a quality learning environment [15] and process for establishing initial respect without prejudice [16], and more importantly for getting student buy-ins for the learning activities [17]. An entrepreneurial culture may be the most vital part of entrepreneurship education as it is important to change culture, but it is crucial to move learners from merely know-how to taking actions.

Program Design – The program design includes the design of the program at the degree, course, and co-curricular levels. The goal for this aspect is to understand how institutions can design their programs to provide opportunities to impact students in cognitive, social, and behavioural domains. It has become clear to us that most of the programs are not standalone course or certificate, but rather a holistic range of activities.

Facilitation – Facilitation refers to learner stimulation through various engagement techniques to involve learners' hands, heads, and heart and therefore enhance the learning process. Instructors have been using a variety of engagement techniques to fulfill the needs of learners at different learning stages and/or in different learning contexts. Besides the commonly used engagement techniques in university teaching, such as active learning, multimedia, and gamification, we found role models, workshops/seminars, and cooperative learning were often adopted by entrepreneurship education programs.

Assessments – In this work, we define assessment as a mindset and set of practices that incorporate the Strength, Improvement, and Insight model for feedback on performance. They describe the current state of the learning culture and desired outcomes. They also measure how the components in the constructive alignments interact with each other, especially how implementing specific facilitation changes other components. Assessments can be conducted in a variety of formats, such as survey, interview, discussion, project, report, reflection, and test [18]. The results of the assessments could be objective, such as the number of students participating in the program, or subjective, such as how well the students have constructed the business models on campus [19].

We believe that this model captures the different factors contributing to the success of an entrepreneurship education program in a more comprehensive manner.

5. Conclusion

In this paper, we examined the landscape of Canadian entrepreneurship education. More importantly, we interviewed four prestigious engineering education programs in Canada to learn about what they do, how they define success, and how they measure success. Based on the information provided in the interviews, we developed a modified constructive alignment model for engineering entrepreneurship education. In this model, we examine how a formal degree program design, the style of facilitation, assessments used in the program, and, more importantly, the entrepreneurial learning culture contribute to program success. Based on this model, we recommend that future engineering entrepreneurship programs should consider deeper integration of curricular, co-curricular, and extracurricular activities to support student success. More importantly, the program should focus on building an entrepreneurial culture on campus. This soft and intangible factor may be a key factor to differentiate the success and quality of programs.

We do acknowledge that this work is developed based on a limited sample of interviews. It may not be able to reflect the full extent and complexity of entrepreneurship education. The model proposed here is intended to be a starting point for discussion rather than a fully validated model.

In the future, we would like to continue to conduct a deeper investigation of program setups to include co-curricular and extracurricular activities in our program analysis. We would also like to interview more universities to understand if the model captures the elements in other universities as well. The authors would like to receive feedback and welcome collaborations on this topic.

References

- [1] E. Fisher, A. R. Reuber, S. Business, and T. Branch, *The state of entrepreneurship in Canada*. Industry Canada Ottawa, ON, 2010.
- [2] I. Government of Canada, “The State of Entrepreneurship in Canada,” Feb. 26, 2010. <https://ised-isde.canada.ca/site/sme-research-statistics/en/research-reports/state-entrepreneurship-canada/state-entrepreneurship-canada> (accessed Apr. 04, 2023).
- [3] G. A. Canada, “Key facts about Canada’s competitiveness for foreign direct investment,” GAC, May 10, 2022. https://www.international.gc.ca/trade-commerce/economist-economiste/analysis-analyse/key_facts-2022-05-faits_saillants.aspx?lang=eng (accessed Apr. 04, 2023).
- [4] G. of C. I. S. Canada, “Aboriginal Entrepreneurship Program: Access to Business Opportunities,” Feb. 18, 2020. <https://www.isc-sac.gc.ca/eng/1582037564226/1610797399865> (accessed Apr. 04, 2023).
- [5] S. Daze, “Entrepreneurship Education in Canada Annual Review.,” *Telfer Sch. Manag. Rep.*, 2021, [Online]. Available: https://telfer.uottawa.ca/assets/documents/Entrepreneurship_Education_in_Canada_2021_Review.pdf
- [6] CAMSC, “Canada Launches the first ever Black Entrepreneurship Program,” *Canadian Aboriginal and Minority Supplier Council*, Sep. 10, 2020. <https://camsc.ca/canada-launches-the-first-ever-black-entrepreneurship-program/> (accessed Apr. 04, 2023).
- [7] “Young entrepreneurs - Canada,” *BDC.ca*. <https://www.bdc.ca/en/i-am/young-entrepreneur> (accessed Apr. 04, 2023).
- [8] J. Biggs, “Constructive alignment,” presented at the Background notes to support a seminar given by Professor John Biggs. jbiggs@bigpond.com ASSESSING LANGUAGE OR CONTENT, 2001.
- [9] P. Kandlbinder, “Constructive alignment in university teaching,” *HERDSA News*, vol. 36, no. 3, pp. 5–6, 2014.
- [10] “Maclean’s Canadian University Rankings 2022: Best Universities by Reputation,” *ApplyBoard*, Dec. 21, 2021. <https://www.applyboard.com/blog/macleans-university-rankings-2022> (accessed Apr. 04, 2023).
- [11] J. B. Biggs, *Study Process Questionnaire Manual. Student Approaches to Learning and Studying*. ERIC, 1987.
- [12] J. Biggs, D. Kember, and D. Y. Leung, “The revised two-factor study process questionnaire: R-SPQ-2F,” *Br. J. Educ. Psychol.*, vol. 71, no. 1, pp. 133–149, 2001.
- [13] C. R. Jain and T. T. Utschig, “Leveraging elements of process education to extend Biggs’ model of constructive alignment for increasing learner achievement,” *Int. J. Process Educ.*, vol. 78, no. 2, pp. 49–59, 2016.

- [14] P. Drucker, "Culture eats strategy for breakfast," *Doesn't It*, 2016.
- [15] D. Apple, P. Smith, S. Beyerlein, and C. Holmes, "Methodology for creating a quality learning environment," *Fac. Guideb. Compr. Tool Improv. Fac. Perform.*, pp. 317–320, 2007.
- [16] P. Smith, "Establishing initial respect without prejudging," *Fac. Guideb. Compr. Tool Improv. Fac. Perform.*, 2007.
- [17] K. Burke, "Getting student buy-in," *Fac. Guideb. Compr. Tool Improv. Fac. Perform.*, 2007.
- [18] J. Biggs, "Enhancing teaching through constructive alignment," *Higher education*, vol. 32, no. 3, pp. 347-364, 1996.
- [19] L. Pittaway, and C. Edwards, "Assessment: examining practice in entrepreneurship education," *Education+ Training*, vol. 54, no. 8/9, pp. 778-800, 2012.