PROMOTING ENTREPRENEURIAL PRACTICE BY CRAMMING A PRODUCT DEVELOPMENT PROJECT OVER A WEEKEND

Kush Bubbar and Dhirendra Shukla
J. Herbert Smith Centre for Technology Management and Entrepreneurship, University of New Brunswick, NB, Canada
Corresponding Author: kush.bubbar@unb.ca

Abstract – As the definition of the engineering profession continues to witness a disruptive transformation in the labour market, engineering schools are beginning to recognize the need to facilitate a new approach to education. Such a disruption has lead to the explosion of entrepreneurship education within the boarders of engineering schools in attempt to generate the talent and skills of the future engineer.

There is however a gap – engineering schools were never designed to deliver entrepreneurship education. Success in this endeavour relies on a new approach to teaching; one that is founded in a group-based, experiential learning environment. At the University of New Brunswick, entrepreneurship education is a core element offered to all our engineering students.

The following article proposes the CRAM – a two day hackathon designed to introduce students to a cohesion of contemporary entrepreneurship practices to accelerate group formation and acquire entrepreneurship skill sets using an inductive teaching approach. The delivery of the CRAM is discussed in detail, along with feedback from the student participants.

Keywords: Hackathons: Entrepreneurship Education: Engineering Education: Design Education: Inductive Learning: Product Development: Professional Practice: Experiential Learning: Andragogy: CRAM

1. INTRODUCTION

Entrepreneurship education has witnessed a significant growth in business schools across the globe [1]. This growth has stimulated interest by engineering faculties, many of whom believe entrepreneurial skills are critical for the contemporary engineer [2]. A simple web search of the keywords ‘engineering’, ‘entrepreneurship’, and ‘Canada’ reveals at least fifteen Canadian academic institutions offering various levels of entrepreneurship programming within their faculties.

Further, a handful of engineering faculties at Canadian institutions have recently offered a Masters Degree program related to technology and entrepreneurship for students with either engineering or STEM related undergraduate degrees. Such programming is not historically traditional within the engineering faculties and thus pose challenges as many of the skills considered entrepreneurial are not “taught” as part of a standard undergraduate engineering or STEM related curriculum leading to a gap in the requisite prior knowledge for the incoming students.

At the University of New Brunswick (UNB), we offer a one year accelerated, Masters in Engineering focusing on Technology Management and Entrepreneurship (MTME). The program is facilitated through a major entrepreneurial project and thus is experiential in nature. The majority of students enrolled identify as international students with no prior relationships with one another.

With a project focus and an accelerated timeline combined with a student cohort without the requisite knowledge in entrepreneurship, and often without any existing personal relationships, students face a significant barrier and are frequently slow to ramp up their productivity to form efficiently functioning teams leading risking their success.

This leads to our research question: is it possible to jumpstart the development of the requisite entrepreneurial knowledge using a shortened proxy project that allows the students to learn via an experiential based learning environment where the risk of failure is low?

To explore this question, we propose the application of a hackathon to facilitate the accelerated requisite learning and present our justification in Section 2 based on prior research in educational psychology. In addition, hackathons have demonstrated the ability to accelerate group formation [3] and we seek to confirm this observation.

1.1. What is the JHSC?

In 1988, Dr. J. Herbert Smith, the former Chief Executive Officer of General Electric Canada, donated his endowment to the University of New Brunswick to
establish a centre that focused on teaching engineering students business related skills. The result founded the J. Herbert Smith Centre (JHSC) for Technology Management and Entrepreneurship (TME) – the first engineering centre in North America with business and entrepreneurial training embedded within an engineering school. Since its inception, the JHSC has experienced tremendous growth now offering a Diploma in TME (DTME) option available for undergraduate students in all faculties, three accelerator programs: a) The Summer Institute, b) Energia Ventures, c) Scale Up Atlantic Canada, and a Masters in Engineering degree in Technology Management and Entrepreneurship.

Finally, StartUp Canada awarded UNB with the prestigious Most Entrepreneurial Post-Secondary Institution of the Year award in 2014 – the last offering of the accolade.

2. TEACHING ENTREPRENEURSHIP

With origins in the 1970s, entrepreneurship education is in its infancy relative to the pedagogical view of the academy. Business schools originally focused on researching the traits that differentiated an entrepreneur from a non-entrepreneur creating a persona of an entrepreneur as a high achieving individual whom is, controlling, a high risk-taker, and has a tolerance for ambiguity. Fisher and Koch [4] went as far as proclaiming that entrepreneurs are “born not made”. In the late 1980s a contrary model was proposed by Gartner [5] whom argued for a behavioural based approach for studying entrepreneurship, leading to the prominent process based methods applied by most business schools today [6].

Modern views of entrepreneurship education are continuously evolving with the vast majority believing that an experiential based teaching model [7] is most appropriate. Below are three interrelated teaching models that have informed the design of our hackathon, implemented to explore our research problem.

2.1. Team-Based Learning

Team-Based Learning (TBL) is a teaching strategy relying on the interactions of a small group of students working on problems within their respective teams. The role of the instructor in TBL is to focus on managing the instructional process instead of dispensing information. Four essential elements of TBL are: a) Groups – students must work in well-formed and managed groups, b) Accountability – students must be accountable for the quality of both individual and group work, c) Feedback – students must receive frequent and timely feedback, d) Assignments – group assignments must be designed to promote both learning and foster team development [8].

2.2. Inductive Teaching

Inductive teaching is a category of teaching strategies focusing on methods for which a specific challenge is presented to a student whom is required to learn what they need to know to address the challenge [9]. Prince and Felder present six inductive teaching methods in [9] with Problem-Based Learning (PBL) as the most relevant to our work. PBL is characterized by student teams working on an ill-structured open-ended real-world problem where the precise definition of the problem has not been established [9]. A meta-analysis was conducted on several PBL studies by Dochy et al. [10] with results suggesting that students acquire and retain more knowledge when taught via a PBL method than when taught with a conventional (deductive) teaching method.

Inductive reasoning is a learning progression that begins from particulars (e.g. observations) leading to abstraction of generalities (e.g. theories) – through induction one infers principles. Deductive reasoning is the opposite learning progression – through deduction one deduces consequences [11].

It is curious to note that most engineering instructors teach using a deductive method for which theory and mathematical models are initially presented followed by concrete examples via exercises. This is in contrast to the natural human learning style which is inductive [11].

2.3. Entrepreneurship as a Practice

Recent developments have proposed the notion that learning entrepreneurship requires students to become an entrepreneur. In particular, by aligning research on entrepreneurial with the scientific method applied in a similar manner to the field of design, Sarasvathy [12] proposed that entrepreneurship is in fact a “science of the artificial” as originally coined by the seminal work of Simon [13]. In this regard, Venkataraman et al. [14] proposed entrepreneurship as a method not a process in contrast to Gartner [5]. Similarly, design researchers have also recognized parallel relationships between entrepreneurship and design [15].

Historically, a process implies a linear staged approach with predictability – for example Morris presents a staged entrepreneurial process in his book [16]. A method, on the other hand, is described in the context of entrepreneurship as a set of techniques and skills that can be structured into practices that motivate students to think and act entrepreneurially [6].

Building on this contemporary view of entrepreneurship, Neck et al. [6] propose that becoming an entrepreneur requires following an entrepreneurial method and suggests five interrelated practices: (1) Practice of Play, (2) Practice
of Empathy, (3) Practice of Creation, (4) Practice of Experimentation, (5) Practice of Reflection as detailed in Fig.1. An excellent quote from Neck et al. summarizes their methodology “Approaching entrepreneurship as a method means teaching a way of thinking and acting built on a set of assumptions using a portfolio of practices to encourage creating.” [6]. In essence, Neck et al.’s model of teaching entrepreneurship education adheres to a constructivist view. Each practice is briefly summarized below.

Fig. 1. Practice Based Framework for Teaching Entrepreneurship Adapted from Neck et al. [6].

3.3.1 Practice of Play. The Practice of Play “relates to the development of a free and imaginative mind, allowing one to see a wealth of possibilities... opportunities, and a pathway to being more [innovative]...” [6]. Play as a verb is a broad term and does not have a single recognized definition, however, it is undeniable that play and games are related. A game often has the following characteristics (a) abstract model of something real, (b) quantifiable, (c) often becomes unconscious. Play and games exist at the intersection of (i) practice, (ii) rules, and (iii) engagement [17]. Hence a game fulfilling (i)-(iii) can be considered a means of Practicing Play. Not surprisingly, gamification has become a hot topic of consideration in the field of entrepreneurship education as a mechanism to practice play [18]. We utilize a hackathon as a vehicle to deliver a game.

3.3.2 Practice of Empathy. McLaren [19] defines empathy as “a social and emotional skill that helps us feel and understand the emotions, circumstances, intentions, thoughts, and needs of others, such that we can offer sensitive, perceptive, and appropriate communications and support”. Neck et al. [6] suggest that the path to practicing empathy is employing techniques from the field of design thinking [20,21]. We practice an empathetic approach to define the problems addressed within our hackathon.

3.3.3 Practice of Creation. The practice of creation is about the importance of creativity in entrepreneurship and an understanding that creativity is not an innate ability we are born with but rather a skill that must be developed. Neck et al. [6] argue that being creative is about promoting a creative mindset within a social context. We will promote a creative mindset through coaching for a creative mindset within our hackathon.

3.3.4 Practice of Experimentation. The practice of experimentation is exactly as one would expect – try something, observe the results, learn and try again. Experimentation is a core principle of design thinking [20,21] and is often described as “learning by doing” and “hands-on work” [9]. Experimentation is a core element of our hackathon.

3.3.5 Practice of Reflection. The practice of reflection is about codifying our experiences to develop a deep understanding of a topic [22]. Reflection results in increased self-awareness and is a pathway for reaching the higher levels on Bloom’s taxonomy in the cognitive domain [23]. In Neck et al.’s model, reflection is centrally supported by each of the other practices as observed in Fig.1 [6]. Reflection has the added benefit of keeping entrepreneurship personal. We encourage the practice of reflection through implementing reflective exercises in our hackathon.

2.4. Emergence of Hackathons

Hackathons are fast-paced, collaborative yet competitive events in which teams work in an environment to identify an idea, implement a usable concept, and present the concept to a panel with time being the primary constraint – time constraints are engaged in days if not hours. Such an environment encourages rapid decision-making and an acceleration through the stages of team formation [24,25].

A hackathon is defined by a set of rules and requires, by definition, engagement thus it may be used as a gamified implementation of an entrepreneurial education activity as per Neck et al.’s definition [6]. Such an argument was considered by Avila-Merino [26] in their work for which students at the University of East Anglia’s Norwich Business School were required to participate in the Sync the City Startup event.

Our work considers a similar implementation as Avila-Merino [26] but with the variation that our MTME cohort not only attend a hackathon, but one that is custom designed by our instructional team to support our students
in achieving the learning objectives outlined in Section 1. This hackathon, labelled as “the CRAM”, is supported throughout the entire event by our instructional team whom play the role of a coach and thus, implement an andragogy based teaching approach as suggested by Neck et al. [27] and previously implemented in an engineering context by Bubbar et al. [28–30].

3. DELIVERING THE CRAM

CRAM is an acronym which stands for the Coaching-based, Rapid-development, Agile, Method and is a colloquialism for students whom accelerate their learning in a highly compressed period in preparation for a major deliverable.

The CRAM is a 2.5-day hackathon carefully designed to support the development of the learning outcomes listed in Section 1 using components of each of the teaching based frameworks presented in Section 2. The CRAM was delivered to our MTME cohort during the first weekend of classes. Presented in Table 1 below is a timeline briefly describing the core activities detailed in the sub sections below.

Table 1: the CRAM Structure.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>DAY</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiential Workshops on:</td>
<td>Day</td>
<td></td>
</tr>
<tr>
<td>• Business Model Canvas</td>
<td>Day 1</td>
<td>1 hr</td>
</tr>
<tr>
<td>• Design Thinking and Empathy and Journey Mapping</td>
<td>Day 1</td>
<td>2 hrs</td>
</tr>
<tr>
<td>• Simplexity™ Method</td>
<td>Day 1</td>
<td>2 hrs</td>
</tr>
<tr>
<td>Dinner and Team Building</td>
<td>Day 1</td>
<td>3 hrs</td>
</tr>
<tr>
<td>Customer Discovery at the Boyce Farmers Market</td>
<td>Day 2</td>
<td>3 hrs</td>
</tr>
<tr>
<td>Data analysis via BMC and map development</td>
<td>Day 2</td>
<td>2 hrs</td>
</tr>
<tr>
<td>Low fidelity prototype fabrication</td>
<td>Day 2</td>
<td>2 hrs</td>
</tr>
<tr>
<td>Pitch presentation basics</td>
<td>Day 3</td>
<td>1 hr</td>
</tr>
<tr>
<td>Pitch development</td>
<td>Day 3</td>
<td>2 hrs</td>
</tr>
<tr>
<td>Pitch delivery</td>
<td>Day 3</td>
<td>1 hr</td>
</tr>
<tr>
<td>Writing a reflection statement</td>
<td>Day 3</td>
<td>0.5 hr</td>
</tr>
</tbody>
</table>

3.1. Experiential Workshops and Team Building

The first day (i.e. Day 1) takes place at an offsite facility and serves as both an introduction between the instructional team and the MTME student cohort in addition to a crash course of the critical components of the program delivered via workshops. Each workshop is delivered by a different instructor starting with the Business Model Canvas [31] and it’s application to developing a single page business plan.

The second workshop focuses on presenting the Design Thinking framework and an ethnographic [32] approach to data capture. We demonstrate the Empathy and Journey mapping toolsets accompanied by their application to a personal activity. The final workshop presents the role of creativity in product development and the Simplexity™ method [33] as a means of enabling creative exploration.

At the conclusion of the last workshop, is a team building session. Dinner is served followed by two hours of team building activities and games. The evening is concluded with students instructed to meet up at UNB the following day.

3.2. Customer Discovery

On the second day (i.e. Day 2) students arrive at 9AM to a designated classroom at the UNB campus and are informed they will be executing an accelerated development project at the Boyce Farmers Market. In this project they will need to: 1) identify a problem, 2) propose a solution, 3) develop a minimum viable product (MVP), and 4) communicate their MVP via a pitch presentation. Students are escorted to the market and are supported by the instructional team on strategies to observe and engage with market customers, local vendors, management, and even politicians.
compiling the data captured using the tools (i.e. BMC, Empathy, and Journey Maps) presented the previous day to formulate a problem statement.

3.4. Low Fidelity Prototype Development

Using the problem statement as a starting point, the instructional team coaches students to build low fidelity prototypes using materials sourced from a local dollar store. These prototypes serve as a discussion point to iterate on both the problem statement and the empathy and journey maps. In this regard, students are encouraged to develop many versions of their low fidelity prototypes to experiment with their ideas eventually leading to convergence onto an MVP. The students work on this iterative approach for the remaining portion of Day 2.

![Fig. 4. Picture of a Low Fidelity Prototype of a Digital Interactive Kiosk Developed While CRAMming.](image)

3.5. Pitch Development

The third day (i.e. Day 3) begins with a workshop on the best practices of developing and delivering a pitch following a Guy Kawasaki based approach [34]. A rubric detailing the specific evaluation criteria for the pitch is presented and the students continue to prepare, practice delivering, and refine their pitches under the guidance and support of the instructional team.

3.6. Pitching MVP to External Panel of Judges

Finally, whether students are prepared or not, each team delivers their pitch presentation to a panel of judges. A strict timing regime is applied to cut off teams whose pitches exceeded the five-minute time limit, thus emphasizing the importance of adhering to the rubric criteria. On completion of the pitch, judges ask a series of questions to provide students and opportunity to practice “thinking on their feet”.

3.7. Creating a Reflection Statement

Upon completion of all the pitches, the hackathon closes and the students are dismissed with the stipulation they must complete a guided reflection statement. The statement is delivered via an online form and consists of a series of open-ended questions to engage reflective thought. Students are not required to complete the form, but must submit the form (completed or not) to earn a participation mark.

4. DISCUSSION

To explore the effectiveness of the CRAM, we started by reviewing the feedback from the reflection statements completed by our students. From the fourteen responses, a few topics were consistent: a) prior to the CRAM students were fearful of developing a product / venture in the program, but upon completion, most felt they could overcome the barrier, b) students realized first hand how important the customer perspective is on developing a product, c) students thoroughly enjoyed getting to know their fellow cohort member through participating in the CRAM, d) many students had a deep desire to return to the market to trial and validate their prototypes with the users they engaged with.

Such feedback was glaringly positive, but we realized that it was difficult to assess long-term impact from reflective statements written immediately after completing the CRAM.

This motivated us to gather mid program feedback without pre-empting the CRAM experience in attempt to avoid bias. In delivering this feedback, the students were keen to explicitly call out how the CRAM resonated by preparing them for the MTME program. Many students recommended the CRAM should become mandatory in future program delivery as it shaped their expectations for the program and created an environment for establishing critical bonding experiences. We did not anticipate the importance of the latter feedback.

Finally, the instructional team received many requests from students outside the MTME cohort and even outside the faculty for opportunities to participate in the subsequent CRAM session, suggesting that such an experience could be universally beneficial to students across the university.

5. CONCLUSIONS

Based on the positive student feedback, we are keen to continue offering the CRAM to future MTME cohorts. If any institutions are offering a similar program, we would be keen to learn about your experiences.

Acknowledgements

We would like to, first and foremost, thank our MTME18-19 cohort for their incredible dedication to dive in and fully participate in the CRAM experience – we are all very proud of your accomplishments. We are also extremely appreciative of all the J. Herbert Smith Centre faculty, staff and external mentors whom participated in the CRAM while giving up part or all of your precious
References