Advances in Engineering Education

SPRING 2020

The New Venture Design Experience: How UPRM made business and engineering students collaborate in entrepreneurial projects by pairing existing courses

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ABSTRACT

Students are attracted to innovation and entrepreneurship. However, it is challenging for them to take courses in I&E due to their already busy curriculums. This paper describes the *New Venture Design Experience*, a one-year interdisciplinary program that pairs core and elective courses between the colleges of Engineering and Business Administration. The program aims to provide the time and resources for students to venture into their own entrepreneurial projects during a one year period, within the classroom setting. Students will first take either Design Thinking, a course that teaches human-centered design with a project-based learning approach; or Consumer Behavior, a course that teaches students about the different factors that influence consumer behavior and the decision process. Each team has members in both courses, which continue working together throughout the year. In the second semester, team members work on their ventures through the Product Design, Capstone, or Technology-Based Entrepreneurship courses. By the end of the program, they will have developed a working prototype, created a crowdfunding pitch, and submitted to an entrepreneurial competition. This leads teams to start impacting society in a positive manner by providing solutions to real-life problems.

Key words: Interdisciplinary, Innovation, Entrepreneurship

INTRODUCTION

Entrepreneurship education has been in constant growth in the past years in Europe, USA and Latin America (Bernstein & Carayannis, 2012; Castellani & Lora, 2014; Storen, 2014) due to the multiple

benefits it provides (Storen, 2014). Some of these include: promoting entrepreneurial and innovative orientations which promote starting a business, increased confidence and initiative in students (Storen, 2014), improved attitudes, skills, and abilities in students (Zabihi & Moghaddasi, 2006), economic growth (Rubach, Bradley, & Kluck, 2015), and creation of employment (Castellani & Lora, 2014). With the growth of entrepreneurship education has come a shift in methods of teaching it, moving from conventional methods to active learning or action-based (Esmi, Marzoughi, & Torkzadeh, 2015). This goes in accordance to Babson College's philosophy that states that to teach entrepreneurship, alternative techniques must be employed rather than the traditional lecture-style course. This is because entrepreneurship positions students to "create, apply, and act" (Greene, 2017, ¶4). Some complementary techniques used to teach entrepreneurship are (1) starting businesses as part of the coursework, (2) serious games and simulations, (3) design-based learning, and (4) reflective practice – where students develop knowledge from experience (Greene, 2017).

Babson College defines entrepreneurship as an applied science (Simon, 1996), "a process of identifying an opportunity, understanding resource requirements, acquiring resources, planning, and implementing (Greene, 2017, ¶1)." Therefore, through this case study, we will be describing how the University of Puerto Rico, Mayagüez Campus (UPRM) has sought to teach entrepreneurship following Babson College's perspective. The *New Venture Design Experience* (*NVDE*), an interdisciplinary initiative at UPRM, incorporates design-based learning into the existing course curriculum. "Design is a process of divergence and convergence requiring skills in observation, synthesis, searching and generating alternatives, critical thinking, feedback, visual representation, creativity, problem-solving, and value creation (Greene, 2017, ¶15)." Utilizing the design-based learning framework to teach entrepreneurship allows students to identify opportunities through observations and value creation that lead to the creation of new ventures (Greene, 2017).

At UPRM, faculty have noticed that students are developing the entrepreneurial and innovation mindset. They have started student associations, opened a MakerSpace, and continuously seek courses outside of their department that help them further develop their entrepreneurial minds. However, heavy course loads and day to day responsibilities are limiting their production. The authors propose that by synchronizing courses (business and engineering) that are important to entrepreneurship, students will have time, mentorship, skills and knowledge to develop their ideas into entrepreneurial projects that have a positive impact on society.

University of Puerto Rico, Mayagüez Campus (UPRM)

The University of Puerto Rico is composed of 11 campuses across the island. The second largest is the Mayagüez campus, composed of four colleges (Business Administration, Engineering, Agricultural Sciences, and Arts and Sciences), around 13,316 undergraduate and 1,033 graduate students and

over 80 active student associations. The campus has had success in multiple student affairs, such as student competitions and faculty development. Multinational companies come to the campus to recruit their next wave of employees every year.

One of the largest student associations is *Idea Platform*, which was founded in December 2014 out of student initiative to have an association that focused on innovation, enabling, creation, design, and entrepreneurship available to the entire student body. *Idea Platform* is only one of the many elements that composes the *UPRM E-Ship Network* (*E-Ship*). *E-Ship* is the network of students, faculty, entrepreneurs, and other partners, that seeks to create opportunities of collaboration between innovative minds. It seeks to aid in transforming ideas into initiatives of research, innovation, and commercialization by providing innovation track courses, workshops, seminars, mentorship, and helping identify funding opportunities for all entrepreneurs in our campus (UPRM Entrepreneurship Network, 2017).

It is through E-Ship that the *New Venture Design Experience* (*NVDE*) began. *NVDE* engages students in a one-year venture working on a design challenge with the support of various courses. It focuses on developing solutions that can have a positive impact on society. Puerto Rico is currently going through a harsh economic crisis. Said crisis is correlated to a massive brain drain that started over a decade ago with the recession (Worstall, 2017). Therefore, it is important to find ways to contribute to our society, that is rapidly depleting in resources and has an aging population.

THE NEW VENTURE DESIGN EXPERIENCE (NVDE)

The *NVDE* engages students in a one-year venture working on a design challenge with the support of various courses. This follows a two-semester sequence that other multidisciplinary programs in innovation and entrepreneurship have also used (Sheppard, et al., 2015). It is kicked off by the *Weekend Design Challenge* (*WDC*) - a weekend long boot camp on Design Thinking strategies. This provides students their first interactions with future team members, allows them to have a preview, and start applying the skills they will be implementing through the *NVDE*.

During the first semester of the *NVDE* (see Fig. 1), students enroll in one of two courses: Design Thinking (Engineering department) or Consumer Behavior (Business Administration department). The Design Thinking course focuses on design thinking methodologies to solve problems, while the Consumer Behavior course focuses on the psychological theories that drive consumer decisions. During this semester, they form interdisciplinary groups. Groups are formed by getting three students from the Design Thinking course and three students from the Consumer Behavior course to work as an entrepreneurial team (e-team). They are able to select their own groups or they may

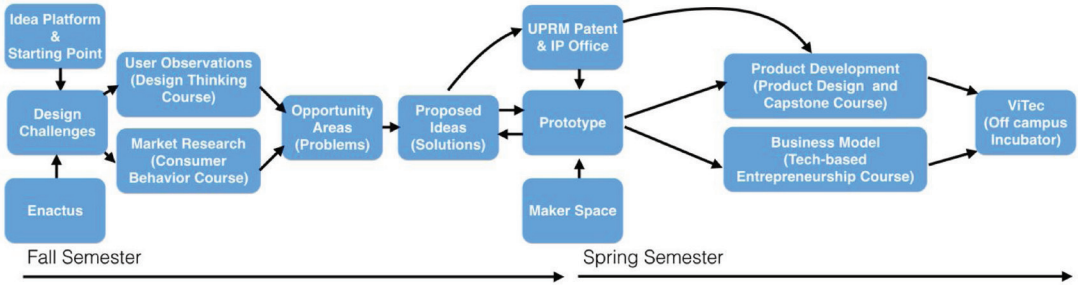

Figure 1. New Venture Design Experience (Lugo, Zapata-Ramos, & Pérez-Vargas, 2016).

be partnered by professors, after students have taken personality assessments and stated market research interests. Afterwards, they select the design challenge they want to work with (see Fig. 1), then conduct primary and secondary research to better understand the design challenge and be able to delineate a precise market opportunity within which to work. Based on market research, they develop over 100 ideas per e-team that could be possible solutions to their problems and select the best option. Finally, they develop a trash prototype of the idea selected that was then validated through additional research. Throughout the semester, they collaborate with the *E-Ship*, receiving feedback not only from professors, but from external mentors specifically assigned to each group, student associations such as *Idea Platform* and *Enactus*, and the Intellectual Property Office. This marks the end of the first semester, as shown in the halfway-point of Figure 1.

During the second semester, students enroll in one of three courses: Product Design, Capstone (Engineering department) or Technology-Based Entrepreneurship (Business Administration department). They commence development of a working prototype of their product, continue to validate their idea, create a crowdfunding pitch video and marketing strategy, and outline an investment and commercialization plan. At the end of the second semester, high potential products have the possibility of continuing their development at a local incubator.

The idea behind the *NVDE* is that each student, with their own expertise, contributes to their e-team substantially, making a well-rounded product and business plan. Students get course credit, do not fall behind in their curriculum and are able to develop an idea from scratch that not only impacts a society, but also provides them with a career path they can pursue.

ASSESSMENT

Two cohorts of the *NVDE* were completed in the academic years 2015–2016 and 2016–2017. Each cohort has taught faculty different strategies to improve the overall experience, such as

assessment. Innovation Self-Efficacy, Design Self-Efficacy, and the Big Five survey have all been used to assess the *NVDE* (Lugo, Zapata-Ramos, & Pérez-Vargas, 2016; Lugo, Zapata-Ramos, & Puig, In Press 2017).

Innovation Self-Efficacy: This scale measures the individual's perception of their capacity to innovate. Using 29 items, participants rate their degree of confidence to do each of the listed activities on a scale from 1 to 100 (Gerber, Martin, Kramer, Braunstein, & Carberry, 2012).

Design Self- Efficacy: This survey is a 36-item instrument used to measure individuals' self-concepts toward engineering design tasks (Carberry, Lee, & Ohland, 2010).

Big Five Survey: This survey describes an individual's personality by using five factors: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism - OCEAN (Cattell, 1996; Jensen, Murphy, & Wood, 1998). Each factor is a classification for a group of traits; if a high score is received for a factor, it means that the corresponding traits most likely identify the individual.

Figure 2 presents the five traits with a description of low and high scores.

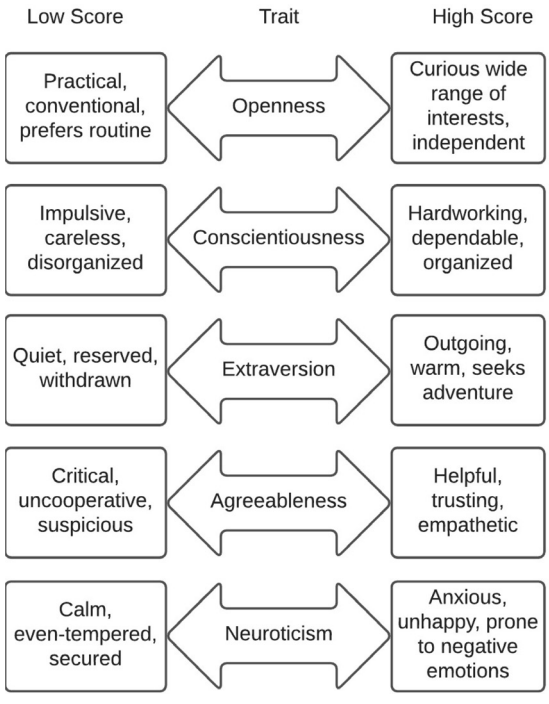

Figure 2. Big Five Personality Traits.

RESULTS

Sixty-two students participated in the first cohort of *NVDE,* 23 and 39 in the Design Thinking and Consumer Behavior courses, respectively. Forty-one students participated in the second cohort, 23 and 18 in the Design Thinking and Consumer Behavior courses, respectively. Most completed the academic year in the *NVDE* program. For the second cohort, instructors narrowed the number of students and teams that could participate in the program; this resulted in increased interaction with each team, more direct feedback, and increased motivation.

Sustainability and Institutionalization

Programs like the *New Venture Design Experience* need continuous funding and sustainability, particularly now when public higher education funding is limited. *NVDE* applied and was awarded a VentureWell (VW) faculty grant. This funding was key to develop the program and demonstrate *NVDE* benefits to our local entrepreneurial ecosystem. These results have been shown to potential sponsors of the programs and the authors are confident that university industry partners will continue to sponsor the program when VW funding stops. Another concern is the institutionalization of the program; however, since it is mostly composed of existing required courses, the courses will continue to be available to students.

Replications at Other Institutions

The program presented here can be transferable to other institutions because it is based on courses that are commonly part of Business or Engineering bachelors' degrees. The first and key component is to identify the courses at one's institution that encourage customer discovery and new product development. Professors must make sure to align both courses so that topics covered converge, and that all assignments are provided and graded as a team with the same amount of points allocated. Then, allot sufficient time to coordinate the interaction between courses and have them physically in the same classroom from time to time to foster team cohesion. Given that courses belong to separate departments which are usually not in close proximity, a key issue is to have both disciplines working together. Classrooms that are close together for the class periods facilitates group interactions before and after class. In this case, this point was addressed by conducting both classes in the Business Administration building. Communication with students and between them can also be facilitated by using platforms such as Slack.

Program Learning Outcomes

The student learning outcomes in *NVDE* are to: understand and execute a basic ethnographic study; identify opportunities for new products, services, or processes based on user needs; identify

the design problem; design various functional prototypes through the semester for user experience (UX) testing; write a technical feasibility study; and demonstrate effective communication skills. Most of these learning outcomes are helpful with ABET accreditation. Also, students from the previous cohort of *NVDE* have reported that the tools learned have set them apart in the job market giving them an advantage over other applicants.

Entrepreneurial Competitions and Expos

Another goal of the *NVDE* is to foster student participation in entrepreneurial competitions. With this in mind, course projects are designed to provide teams with all the tools needed to apply to most entrepreneurial competitions.

Some *NVDE* e-teams have continued their projects beyond the courses with the help of external grants for entrepreneurial projects. From the first cohort, three teams applied to competitions in order to obtain external funds (i.e. VentureWell E-team Stage 1). The team that was selected continued the project beyond *NVDE* and participated in Guayacán (a non-profit organization that promotes Puerto Rico's entrepreneurial ecosystem) I-CorpsPR program. A handful of students that participated in the program are also working on other entrepreneurial projects. They have participated in Guayacán I-CorpsPR, and EnterPRize (a local entrepreneurial competition). Some teams have applied with different ideas than the ones developed in *NVDE*. This is because the most important aspects they develop in this program are an entrepreneurial mindset, and a set of skills that they can apply to other endeavors.

At the UPRM, *NVDE* teams participate in *Expo Ideas*, a public exposition of inventions and other entrepreneurial projects. There, teams have another opportunity to gather feedback for their project outside of the classroom setting. This event also helps teams to improve communicating their idea.

Grants Submitted

In a period of two years, *NVDE* teams have been able to submit to VentureWell E-teams a total of seven grants, six for stage one and one for stage two. From *NVDE* one team has been awarded the stage one grant. The process of applying to external funding has been helpful and a good motivator for teams to go beyond what is required in class and really excel.

Lessons Learned

The *NVDE* has been on continuous improvement since its first year. The authors recognize that the ever-changing technology and innovation field needs programs that can adapt quickly to provide students with the relevant tools for their success. The main source of actionable feedback has been gathered in a focus group setting in which a moderator facilitates a conversation with the students

of what they like and can be improved in *NVDE*. The main challenge has been to align all e-teams to be at the same stage of the entrepreneurial process during the program. They all start from the same stage; however, because of the unique nature of each team, their customer discovery time can vary. This is a challenge when two courses need to be in sync with their timing of topics. This has been managed through periodic presentations of progress where all groups must present the next phase of their work. This first stage is research gathered on the design challenge that helps delineate a specific problem. The second stage, the problem/opportunity identification, is where students present the top problem/market opportunity to be solved. During the third stage, the students present solutions to the problem identified. Finally, in the fourth presentation, students present a prototype and selling-pitch. This encompasses the first semester of NVDE. The second semester is managed in a similar manner, with periodic presentations where students present crowdfunding developments and entrepreneurial competitions' submissions.

Another challenge addressed was recruitment for the *NVDE*. In order to assure that students with the right mindset were registering in the program, courses were closed off from regular registration. Students were registered through professors after a short orientation of the *NVDE* and an interview was conducted with the interested party. Students learn about the *NVDE* through word-of-mouth, orientations in each department, flyers created by students in other marketing courses, radio interviews, social media posts, and more.

CONCLUSION

This paper presented an interdisciplinary experience in which students worked on an entrepreneurial project between engineering and business courses. This with the goals of fostering an entrepreneurial mindset and having a positive impact on society. The general ideas presented here can be applied to other institutions to foster the entrepreneurial mindset.

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