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Lean Collaboration on Campus? A Social Network and Bricolage Approach

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ABSTRACT

Benefits of interdisciplinary student participation in a university's entrepreneurial activities are well known. Still, institutional barriers (structural, temporal, spatial, economic, attitudinal) conspire to block participation. Aided by the NSF's *Pathways to Innovation Program,* the authors conducted a field experiment to increase STEM student participation in a high-profile business proposal competition (BPC). The experiment employed two interventions: informal social networks and bricolage – the innovative and parsimonious use of existing resources. Utilizing these interventions, the authors collaborated to innovatively exploit the Business College's BPC and Engineering College's capstone engineering projects course (CEP). The goal was to facilitate and track STEM students' BPC participation. Participation was voluntary, and not graded. Participation in the BPC increased from 10 STEM students to 27 and the number of BPC finalists increased from 1 STEM-business interdisciplinary team to 4 following the intervention. Findings demonstrate that social network and bricolage-inspired intervention appear useful in increasing STEM student and interdisciplinary team BPC participation and success.

Key words: Interdisciplinary, Co-curricular, Entrepreneurship

INTRODUCTION

The challenge undoubtedly sounds familiar – interdisciplinary collaboration is powerful in driving student entrepreneurship, yet it remains stubbornly difficult to accomplish (Katz, 2003; Dutta, Li, and Merenda, 2011).

Calls for tearing down "silos" and otherwise breaching the familiar barriers inhabiting traditional university campuses are noble, but often prove unworkable (Navarro, 2008). Therefore, rather than offering a further critique of silos or calling for greater funding of Innovation and Entrepreneurship (I&E) education (both of which the authors highly regard), this study focuses on a different approach to addressing these challenges. Specifically, the authors draw on their experiences as a highly-interdisciplinary *Pathways to Innovation* team, on I&E education research, and on the concepts of "social networks" and "bricolage" to address the primary research question for this study: how does one more effectively drive interdisciplinary student entrepreneurship without the use of additional resources and without engaging in any structural changes?

When first posing this question, thoughts of alchemists attempting to create something out of nothing came to mind. However, in retrospect, this task is similar in some ways to that which entrepreneurs face in more traditional settings. A search of the broader entrepreneurship and innovation literature revealed two concepts that could provide guidance on how to use means that already exist (and are already budgeted for) in creative ways: (1) informal social networks as an alternative to formal organizational structures (e.g., joint faculty appointments, co-listed courses) to help connect potential collaborators (Kilduff and Brass, 2010); and (2) "bricolage" to help motivate creative rearrangement of existing resources (Baker and Nelson, 2005). In this paper, we follow mainstream entrepreneurship research in defining bricolage as "making do by applying combinations of the resources at hand to new problems and opportunities" (Baker and Nelson, 2005). That is, we accept the limited resources that may be available at universities, and in keeping with true entrepreneurial spirit, the goal is to use whatever can be assembled to create I&E experiences for students.

Guided by these concepts, and with the help of the National Science Foundation's *Pathways to Innovation Program*, the authors designed a field experiment to study and advance interdisciplinary entrepreneurship collaboration at the University of New Hampshire (UNH). The approach leveraged each of the authors' informal relationships with other faculty members in separate colleges (i.e., social networks) to create intersections (i.e., an experimental "intervention") between two existing programs (i.e., bricolage) that are almost completely parallel in function and structure: the "capstone engineering projects" (CEPs) of our STEM undergraduate students and our business proposal competition (BPC). The outcome measures included STEM student participation, interdisciplinary team participation, and performance of these groups in the BPC. Beyond these intervention efforts, there were no programmatic or resource changes to either the CEPs or BPC.

BARRIERS TO STEM PARTICIPATION IN I&E ACTIVITIES

Past research has identified institutional, structural, technical, and behavioral barriers at play in limiting the participation of STEM students in I&E activities. For example, lack of faculty encouragement, highly structured course sequences aimed at accreditation bodies, and limited evidence of immediate benefits all may reduce STEM student participation in I&E activities (Standish-Kuon and Rice, 2002; Duval-Couetil, Shartrand, and Reed, 2016; Duval-Couetil, Reed-Rhodes, and Haghighi, 2012).

While suggestions to tackle these problems by simply “changing incentives” and “finding more resources” are, in fact, appreciated, one must also question how feasible these recommendations are in many situations. Therefore, instead of broad advocacy for changing incentives, eliminating silos, or undertaking other costly initiatives, the authors have focused on the basic question: *Why* don’t more STEM students engage in innovation and entrepreneurship-related activities?

From past research and experience, a number of hypotheses have emerged, including those proposing that students simply are not interested in such activities or struggle to make these activities a priority. Other perspectives suggest that students see entrepreneurship as relevant only to individuals who want to start their own businesses, rather than seeing it as a broader skill set also applicable within established organizations. This notion of the “entrepreneurial mindset” and its broad applicability may be well known to scholars researching entrepreneurship (McGrath and MacMillan, 2000), but perhaps a disconnect exists between the meaning of the term “entrepreneurship” to professionals and university students.

In an effort to clarify these competing connotations, the authors first focused on separating the “lack of student interest” hypothesis from the “lack of student bandwidth” hypothesis. Empirically, these hypotheses produce the same result – a lack of participation in I&E activities. However, different underlying causal mechanisms exist for these two hypotheses. If the causal mechanism for students not participating in I&E activities stems from an inherent lack of interest, this may be a more difficult challenge to address. However, if students’ schedules are loaded with more urgent tasks (e.g., for-credit classes, paid work, and a wide variety of other obligations), extracurricular I&E activities may simply not be viewed as a priority. In this second scenario, one may be better equipped to help students rearrange existing activities in a way that allows them to more easily engage with I&E.

Next, the authors focused on distinguishing a lack of awareness from a lack of salience regarding I&E activities. As with the “interest” vs. “bandwidth” hypothesis, both a lack of awareness and a lack of salience generate similar patterns (i.e., low participation in I&E activities). As an example of the “awareness” challenge, times and locations of I&E activities may become lost in the myriad of other activities hosted on university campuses. Contrastingly, students may be aware of I&E activities, but refrain from participating because they do not seem as relevant to their “home” areas of study. While increasing awareness may be a fairly straightforward process of promotion, increasing salience is likely more difficult. As a result, the authors also considered how the “interpretation” of core I&E concepts might influence the salience of these activities amongst STEM students. The lack of awareness and/or difficulties in “interpreting” between various fields (i.e., STEM vs. business) may also be responsible for limiting the engagement of STEM students in extracurricular I&E activities.

EMPIRICAL SETTING

In order to discern which of these dynamics (i.e., interest, bandwidth, awareness, interpretation) are at play (and most influential), the authors designed a field experiment. The setting for this experiment was the Business Proposal Competition, a competition open to students of all majors and grade levels, which (at the time of our experiment) was in its 28th consecutive year. Traditionally, the vast majority of participants are undergraduate students. The BPC consists of four elimination stages set over the course of one semester. Entrants can win approximately $100,000 in cash and prizes. The competitors must first provide a simple two-page proposal to enter. If selected to continue, participants must then submit a five-page proposal with financial projections. In rounds three and four, the contestants undergo two consecutive stages of "business pitches" to external judges. At the end of the final round, a winner is selected. While entry into the BPC is required for some business classes, the competition is considered an extra-curricular activity for non-business students.

While historically STEM teams have performed well in the BPC and benefited from their involvement, participation levels for the group remained low despite significant efforts to raise the number of entries. For example, while revising guidelines to limit business jargon and transitioning from requiring a full business plan to a business proposal have helped increase participation in the BPC by non-business students, most of these gains did not include STEM students. Furthermore, the university's advertising of its renewed strategic focus on building an "Entrepreneurial Campus" that fosters technology commercialization and entrepreneurship across all disciplines did little to boost participation. The overall number of BPC entrants from STEM disciplines remained extremely low (9.2% in 2015) despite UNH being a major research university with well-recognized strength across the STEM fields.

In addition to being an interesting and accessible empirical setting for this study, student-focused entrepreneurship events and programs have been used in a number of other studies. For example, Meyer and colleagues (2011) described in detail the evolution of the University of Oregon's interdisciplinary graduate-level "Technology Entrepreneurship Fellows Program" suggesting that an informal faculty network was leveraged to initiate this effort. Similarly, student business plan competitions (and comparable events) can offer scholars a window to some of the earliest stages of the entrepreneurial process as these events provide fairly large datasets that also include "failed" ventures (Der Foo, Wong and Ong, 2005) – an especially difficult element to find in data on nascent organizations (Thornton, 1999).

STUDY DESIGN

In designing the aforementioned field experiment, the authors took inspiration from entrepreneurship itself. For example, entrepreneurs often find themselves facing daunting odds, entrenched interests, and difficult-to-change status quos, all of which are things familiar to advocates of interdisciplinary I&E education. To do this, the authors drew upon two streams of literature from entrepreneurship and innovation research: bricolage and social networks.

Of particular interest is the application of bricolage to I&E education since many universities are moderately to severely resource-constrained (a condition under which Senyard and colleagues (2014) found bricolage beneficial for firm financial performance). That is, launching new programs such as interdisciplinary joint degrees and other interesting yet resource-intensive ventures may be difficult or even impossible. Instead, bricolage inspires one to use what one already has “at hand” in new and non-obvious ways to reach particular goals. (Please refer to Fisher’s 2012 article for a detailed comparison of bricolage to the similar, yet distinct, concept of entrepreneurial effectuation.) It is important to note that bricolage is not just an imperative to “do more with less” or “be more efficient.” Rather, the creative rearrangement of resources to generate true novelty and markedly better outcomes remains central to the definition of what bricolage is (Baker and Nelson, 2005). Furthermore, since universities (especially large research universities) are complex organizations, the notion that educators (or their students) are all aware of what is truly “at hand” and how it may be used more creatively to drive I&E participation is perhaps overly optimistic.

Tying the concepts of bricolage to the first question of whether STEM students are simply not interested in I&E or whether they had difficulty finding the “bandwidth” to participate in I&E activities, the authors focused on heavily encouraging senior engineering students to enter their “capstone projects” into the BPC. If the students simply were not interested, then any increase in BPC participation was not expected. However, if the students were interested, but thought they were unable to start an additional project simply for the BPC, then bricolage (i.e., the creative use of these existing capstone projects as BPC entries) should help increase participation.

Inspiration also stemmed from research into the power of informal networks. Rather than advocating for formal “inter-silo” mechanisms (e.g., co-listed courses, joint degree programs, interdisciplinary minors, joint faculty appointments, etc.), the authors focused on the pre-existing silo-spanning social networks amongst faculty members as a low-cost and quickly deployable method of testing the effectiveness of a program-level (i.e., CEPs and BPC) bricolage intervention. Past research demonstrates that such informal social networks can be powerful in driving innovation (Powell, Koput and Smith-Doerr, 1996). Although such networks are multifaceted and their exact causal pathway is often difficult to observe (Podolny, 2001), leveraging such networks could potentially aid with both the “awareness” and the “interpretation” challenges of I&E activities.

To see if it is possible to leverage campus inter-silo colleague-to-colleague networks in the service of boosting STEM participation in the BPC, I&E promotion efforts began with the authors – an interdisciplinary faculty team – attending the *Pathways to Innovation* retreat in Scottsdale, Arizona, in January 2016. As a direct result of this retreat, a number of ways to increase campus I&E participation were identified, including encouraging the participation of STEM students in the university BPC. To do this, the STEM-based faculty members of the team reached out to their colleagues who supervised CEPs across the various science/engineering disciplines, and asked for an opportunity for the business-based faculty members of the team to “pitch the idea” to STEM students in an effort to encourage them to enter their CEPs in the BPC.

Complex organizations, such as universities, contain a web of overlapping and interacting networks that vary in their degree of formality. However, faculty at the university follow much of the network literature that distinguishes between networks of primarily formal relationships (e.g., professors and students in their classes, faculty members and their department chairs) and networks of primarily informal relationships often referred to as “advice” networks (Rank, 2008). The presence of these informal network relationships provided an opportunity to implement a primary intervention. Specifically, the business faculty members responsible for coordinating the BPC visited the CEP-related senior capstone classes to inform the STEM student teams of the university BPC, thereby ensuring student awareness of the event. During this process, some CEP teams reported being previously unaware of the BPC altogether, despite extensive marketing efforts, which included disseminating posters in the main “engineering” building, advertising on “all student” LISTSERVs, and posting on multiple social media channels. Other CEP teams indicated that they had heard of the BPC, but also expressed confusion as to what it exactly entailed and how it related (or did not relate) to their work as STEM students.

During these interventions, the business faculty members were careful to re-interpret business concepts (such as “minimally viable product” (MVP)), and specific financial terms into concepts that STEM students could relate to. Many of these students were surprised that a fully functioning prototype was not required to enter the BPC, despite the BPC website’s explicit statement advising such. Similarly, the concept of a MVP proved difficult to grasp, since it does not directly align with the more traditional approaches to prototype development familiar to UNH STEM students. Furthermore, the STEM students were largely surprised that financial projections for startup companies are educated guesses (at best), a concept that is very different (even contradictory) to the relative certainty that is normally (rigorously) expected from these students in their classwork. For example, one student even expressed concern that he was “lying” because he could not be totally certain about the sales projections he had generated as part of his team’s BPC entry.

Figure 1 offers a conceptual model of the pre-intervention state at the university across the dimension relevant to this study. Although the focus is on the informal network linking business and STEM faculty members who facilitated the interventions, the authors do not contend that formal relationships were not also at work in the BPC. For example, some business faculty members required their students to enter the BPC and could enforce this request through formal mechanisms like assigning a letter grade for participation. In contrast, the authors used their informal network of relationships to

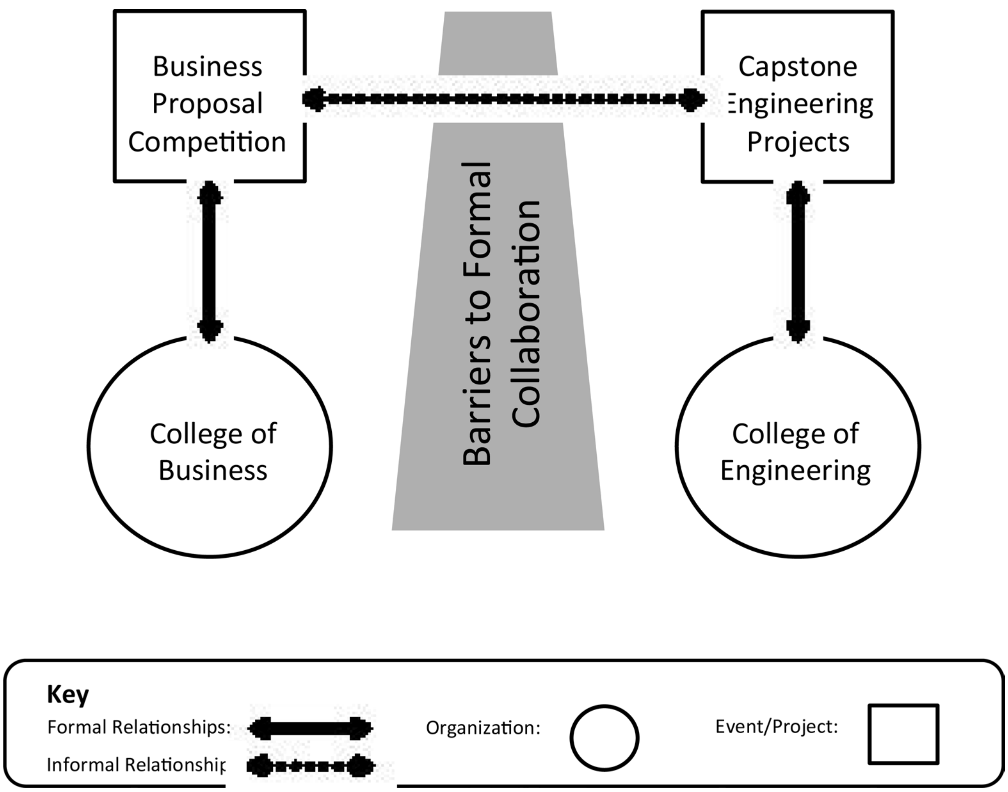

Figure 1. Pre Intervention.

encourage STEM students to enter the BPC since it was not an academic requirement (either at the course- or program-level). In some cases, the STEM students did work with business school faculty to help improve their BPC entries. However, these relationships were still informal, as the networks literature considers the relative formality (e.g., grading versus ad hoc advising) and hierarchy (e.g., professors versus students) of relationships as distinct concepts (Soda and Zaheer, 2012).

ANALYSIS AND RESULTS

The authors implemented their networks and bricolage-inspired intervention during the time period near the entry deadline of the 2016 BPC. Using registration software from the BPC, the academic discipline of each student entrant was recorded and used to track the participation and success of STEM students and interdisciplinary teams (teams with at least one STEM member) in advancing through the BPC over the semester-long competition. A number of pre (2015) and post (2016) intervention comparisons were obtained; the results of which are summarized in Table I.

Table 1. Pre and Post Intervention Outcomes.

Total BPC Participation (Students)	**2015 N = 109 Students**	**2016 N = 116 Students**
STEM Students	10 (9.2%)	27 (23.3%)
BPC Championship (Teams)	**2015 N = 6 Teams**	**2016 N = 6 Teams**
Business & STEM Finalists	1 (16.6%)	4 (66.6%)

The judging of the UNH BPC takes place in four stages, with the number of teams being winnowed from an initial pool of approximately 70 teams to 50, 20, and 6 teams across the first, second, semi-final, and championship rounds, respectively. The judges for the first and second rounds were faculty and staff members with entrepreneurship knowledge and interest. The judges for the semi-final and championship rounds were external (i.e., off-campus) professionals with backgrounds in entrepreneurship, corporate strategy, innovation, and venture capital. The pool of BPC judges remained largely the same between 2015 and 2016, and the judges were provided with the same evaluation rubric for both years.

DISCUSSION

The experiment in this study demonstrates that employing a network and bricolage-inspired intervention was useful in increasing STEM student participation in a high-profile interdisciplinary I&E activity at UNH. Beyond simply having more STEM students participate in BPC (the original goal and research question in this study) an emergent finding was that this surge in STEM participants also appears to have helped drive the creation of interdisciplinary teams, again with no formal requirements to do so. When STEM students first assessed their CEPs in light of the BPC entry requirements, many saw the need for a business "interpreter" on their team and reached out through their own networks to friends, former classmates, and others who were able to fill that role. For instance, one team of three engineering students who had decided to enter their CEP in the BPC, feeling "stuck" on the business-side of their entry, decided to invite their roommate (who was a top accounting and finance student) to join their team. This new interdisciplinary team went from struggling with their first round BPC entry to being one of final six teams selected for the BPC championship.

Beyond these specific outcomes of this intervention, the authors believe the approach exercised in this study is widely applicable to other universities that are struggling to increase participation in interdisciplinary I&E activities. Specifically, the chosen intervention was designed fairly quickly, used minimal organizational and faculty resources, and did not require any formal structural changes (e.g., modifying degree requirements, creating new courses, offering joint faculty appointments) As a result, this approach does not require radical cultural change or significant "slack" resources for progress.

While the authors are enthused by these particular results, one must also discuss some unexpected outcomes. Specifically, efforts were made to explore less formal channels to encourage interdisciplinary I&E work. However, the empirical results of the field tests in this paper, although modest in scale, have helped to break the "no data, no change, no data" cycle that can bedevil advocacy for more formal alterations. For example, after this study, it is less tenable to claim that there is a general disinterest in I&E amongst the university's STEM students. It is also less reasonable to assert that STEM students simply "don't have the time" to explore the commercial side of their capstone projects (i.e., participate in events such as that of the BPC). Whether or not addressing these initial objections will lead to more permanent program changes is still open to question. However, the results of this study may help to better reveal the true underlying frictions by eliminating alternative explanations.

While pleasantly surprised at the effectiveness of the intervention (highlighted in Figure 2), this approach is considered to be low-cost, but not zero cost as the intervention still requires willing and

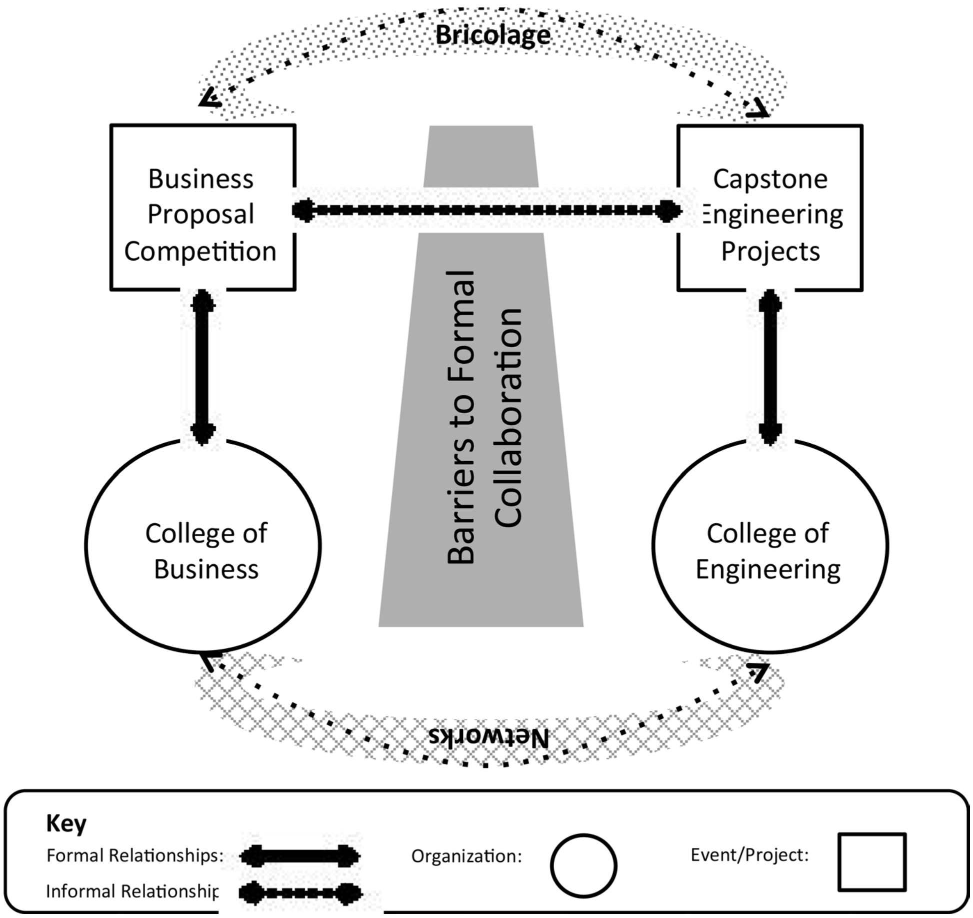

Figure 2. Post Intervention.

capable "bridge builders" (e.g., business faculty with technology entrepreneurship backgrounds, STEM faculty engaged in technology transfer) to make use of their personal networks to promote I&E activities. Furthermore, as attractive as the bricolage concept is, there was still a faculty-driven "interpretation" process that needed to take place even when a CEP was "close to market" and, therefore, an appropriate fit for the BPC. In other words, the authors do not see this approach as some sort of panacea, but rather something likely feasible on many campuses that may help hurdle common challenges and objections.

LIMITATIONS AND FUTURE RESEARCH

Although the authors are pleased with the results of the applied intervention, this study features a number of limitations. Specifically, the study takes place on a single campus and focuses on a narrow set of disciplines (STEM and business) that possess somewhat of a "natural fit" with I&E activities. Additionally, due to the design of the study, parsing results as to the marginal impacts of bricolage, awareness, and interpretation, respectively, is not something that can be accomplished with great precision.

On a related note, in future research the authors would like to be more precise regarding the level of analysis with which bricolage occurs. This study is conceptualized as one of project/event-level bricolage (i.e., readily observable CEPs and BPC entries). However, this intervention could have triggered something akin to mental bricolage amongst the STEM students where they recast I&E activities in better alignment with their STEM-focused identities. Decoupling bricolage in such a way would undoubtedly be an interesting study, but it would also require design and methods different to what are employed here.

Although a significant pocket of STEM students were successfully persuaded (with the proper "interpretation" efforts) to enter the BPC, it is difficult to tell whether these students were pre-disposed or whether they experienced something more transformational. It is anticipated that at some point, further scaling of this interdisciplinary I&E work will require at least some degree of structural, curriculum, and other more formal change related to aspects of university life. And while commenting on how to do this effectively is outside the scope of this particular study, the data collected here is useful in addressing at least two objections to investments in I&E education: (1) that students simply are not interested, and (2) that students do not have the time to participate in I&E activities.

In conclusion, interdisciplinary I&E education remains critical to solving a myriad of social problems and driving a vibrant economy. However, despite this wide recognition, it still proves difficult to actually implement such an I&E educational program. The authors do not contend that the approach in this paper is a panacea, only that it might be a feasible and effective starting point for universities interested in increasing student engagement with I&E activities.

REFERENCES

Baker, Ted and Reed E. Nelson. “Creating Something from Nothing: Resource Construction through Entrepreneurial Bricolage.” *Administrative Science Quarterly* 50, no. 3 (2005): 329–366. *JSTOR*, www.jstor.org/stable/30037207.

Der Foo, Maw, Poh Kam Wong, and Andy Ong. “Do Others Think you Have a Viable Business Idea? Team Diversity and Judges’ Evaluation of Ideas in a Business Plan Competition.” *Journal of Business Venturing* 20, no. 3 (2005): 385–402. https://doi-org.libproxy.unh.edu/10.1016/j.jbusvent.2004.04.001.

Dutta, Dev K., Jun Li, and Michael Merenda. “Fostering Entrepreneurship: Impact of Specialization and Diversity in Education.” *International Entrepreneurship and Management Journal* 7, no. 2 (2011): 163–179. http://dx.doi.org/10.1007/s11365-010-0151-2.

Duval-Couetil, Nathalie, Angela Shartrand, and Teri Reed. “The Role of Entrepreneurship Program Models and Experiential Activities on Engineering Student Outcomes.” *Advances in Engineering Education* 5, no. 1 (2016): 1–27. https://eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=EJ1090582.

Duval-Couetil, Nathalie, Teri Reed-Rhoads, and Shiva Haghighi. “Engineering Students and Entrepreneurship Education: Involvement, Attitudes and Outcomes.” *International Journal of Engineering Education* 28, no. 2 (2012): 425. https://www.researchgate.net/publication/286953529_Engineering_Students_and_Entrepreneurship_Education_Involvement_Attitudes_and_Outcomes.

Fisher, Greg. “Effectuation, Causation, and Bricolage: A Behavioral Comparison of Emerging Theories in Entrepreneurship Research.” *Entrepreneurship Theory and Practice* 36, no. 5 (2012): 1019-1051. https://doi-org.libproxy.unh.edu/10.1111%2Fj.1540-6520.2012.00537.x.

Katz, Jerome A. “The Chronology and Intellectual Trajectory of American Entrepreneurship Education: 1876–1999.” *Journal of Business Venturing* 18, no. 2 (2003): 283-300. https://doi-org.libproxy.unh.edu/10.1111%2Fj.1540-6520.2012.00537.x.

Kilduff, Martin and Daniel J. Brass. “Organizational Social Network Research: Core Ideas and Key Debates.” *Academy of Management Annals* 4, no. 1 (2010): 317–357. https://www.researchgate.net/publication/233245609_Organizational_Social_Network_Research_Core_Ideas_and_Key_Debates.

Kuratko, Donald F. “The Emergence of Entrepreneurship Education: Development, Trends, and Challenges.” *Entrepreneurship Theory and Practice* 29, no. 5 (2005): 577-598. https://doi-org.libproxy.unh.edu/10.1111/j.1540-6520.2005.00099.x.

Maguire, Steve, Cynthia Hardy, and Thomas B. Lawrence. “Institutional Entrepreneurship in Emerging Fields: HIV/AIDS Treatment Advocacy in Canada.” *Academy of Management Journal* 47, no. 5 (2004): 657-679. www.jstor.org/stable/20159610.

McGrath, Rita Gunther and Ian C. MacMillan. *The Entrepreneurial Mindset: Strategies for Continuously Creating Opportunity in an Age of Uncertainty*. MA: Harvard Business Press, 2000.

Meyer, Alan D., Kathryn Aten, Alan J. Krause, Matthew L. Metzger, and Samuel S. Holloway. “Creating a University Technology Commercialisation Programme: Confronting Conflicts between Learning, Discovery and Commercialisation Goals.” *International Journal of Entrepreneurship and Innovation Management* 13, no. 2 (2011): 179-198. http://hdl.handle.net/10945/48657.

Navarro, Peter. "The MBA Core Curricula of Top-ranked U.S. Business Schools: A Study in Failure?" *Academy of Management Learning & Education* 7, no. 1 (2008): 108–123. www.jstor.org/stable/40214503.

Podolny, Joel M. "Networks as the Pipes and Prisms of the Market." *American Journal of Sociology* 107, no. 1 (2001): 33–60. http://heinonline.org/HOL/Page?handle=hein.journals/secdoc132&div=111.

Powell, Walter W., Kenneth W. Koput, and Laurel Smith-Doerr. "Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology." *Administrative Science Quarterly* (1996): 116–145. www.jstor.org/stable/2393988.

Rank, Olaf N. "Formal Structures and Informal Networks: Structural Analysis in Organizations." *Scandinavian Journal of Management* 24, no. 2 (2008): 145–161. https://doi-org.libproxy.unh.edu/10.1016/j.scaman.2008.02.005.

Senyard, Julienne, Ted Baker, Paul Steffens, and Per Davidsson. "Bricolage as a Path to Innovativeness for Resource-constrained New Firms." *Journal of Product Innovation Management* 31, no. 2 (2014): 211-230. https://doi.org/10.1111/jpim.12091.

Soda, Giuseppe and Akbar Zaheer. "A Network Perspective on Organizational Architecture: Performance Effects of the Interplay of Formal and Informal Organization." *Strategic Management Journal* 33, no. 6 (2012): 751-771. https://doi.org/10.1002/smj.1966.

Standish-Kuon, Terri and Mark P. Rice. "Introducing Engineering and Science Students to Entrepreneurship: Models and Influential Factors at Six American Universities." *Journal of Engineering Education* 91, no. 1 (2002): 33. https://onlinelibrary.wiley.com/doi/pdf/10.1002/j.2168-9830.2002.tb00670.x.

Thornton, Patricia H. "The Sociology of Entrepreneurship." *Annual Review of Sociol*ogy 25, no. 1 (1999): 19-46. www.jstor.org/stable/223496.

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