Institutionalizing Campus Innovation and Entrepreneurship Programming by Optimizing a Faculty Grantmaking Process: A Case Study

Victoria Matthew, VentureWell

Victoria Matthew is Senior Program Officer for Faculty Development at VentureWell, where she plays a lead role in the Pathways to Innovation Program, Epicenter's faculty development and engagement strategy. She designs in-person and online convenings, engages experts, and curates content that fosters the Pathways faculty goals of integrating entrepreneurship and innovation into undergraduate engineering. Prior to joining VentureWell, Victoria worked for over a decade in higher education. She has designed, developed and managed degree, and certificate programs, and has experience as an online instructor, and mentor and trainer of other online instructors.

Dr. Jeffrey E. Froyd, Texas A&M University

Dr. Jeffrey E. Froyd is a TEES Research Professor in the Office of Engineering Academic and Student Affairs at Texas A&M University, College Station. He received the B.S. degree in mathematics from Rose-Hulman Institute of Technology and the M.S. and Ph.D. degrees in electrical engineering from the University of Minnesota, Minneapolis. He was an Assistant Professor, Associate Professor, and Professor of Electrical and Computer Engineering at Rose-Hulman Institute of Technology. At Rose-Hulman, he co-created the Integrated, First-Year Curriculum in Science, Engineering and Mathematics, which was recognized in 1997 with a Hesburgh Award Certificate of Excellence. He served as Project Director a National Science Foundation (NSF) Engineering Education Coalition in which six institutions systematically renewed, assessed, and institutionalized innovative undergraduate engineering curricula. He has authored over 70 papers and offered over 30 workshops on faculty development, curricular change processes, curriculum redesign, and assessment. He has served as a program co-chair for three Frontiers in Education Conferences and the general chair for the 2009 conference. Prof. Froyd is a Fellow of the IEEE, a Fellow of the American Society for Engineering Education (ASEE), an ABET Program Evaluator, the Editor-in-Chief for the IEEE Transactions on Education, a Senior Associate Editor for the Journal of Engineering Education, and an Associate Editor for the International Journal of STEM Education.

Ms. Raina Michelle Khatri, Western Michigan University

Raina is currently a graduate research assistant pursuing a PhD in Science Education: Physics at Western Michigan University. She holds bachelors degrees in Physics and English from Hope College and a masters degree in Physics from Western Michigan University. She has worked as an assistant editor for the online magazine Physics to Go and interned at the American Physical Society and the Center for History of Physics, and her doctoral work is centered on the sustained adoption of educational innovations.

Dr. Thomas M. Katona, California Polytechnic State University, San Luis Obispo

Thomas Katona is an Assistant Professor of Innovation and Entrepreneurship at the California Polytechnic State University in San Luis Obispo (Cal Poly). He works in the BioMedical Engineering Department and has a joint appointment in the Orfalea College of Business. Before joining Cal Poly, he worked in startup companies in the LED and LED lighting industry. His roles in industry included leading product development teams, business development, and marketing.

He received a Ph.D. in Electrical Engineering from UC Santa Barbara, studying with the inventor of the blue and white LED, and an MBA from the University of South Carolina, Moore School of Business.

Dr. Robby Sanders, Tennessee Technological University

Dr. Robby Sanders is an Assistant Professor at Tennessee Technological University (TTU) in the Department of Chemical Engineering. He obtained his Bachelors of Science in Mechanical Engineering from TTU in 1995, and he obtained his Master's degree and his PhD in Biomedical Engineering from Vanderbilt University in 1998 and 2001, respectively. His research efforts address 1) innovation-driven

learning with a focus on student learning at disciplinary interfaces, 2) clinical diagnostics and therapeutics for diseases of the lungs, 3) wound healing, and 4) performance of soft gel materials. Recent courses taught by Dr. Sanders include Clinical Immersion at Disciplinary Interfaces, Transport in Biochemical and Biological Processes, Hemodynamics and Microrheology of Blood Suspensions and Other Biofluids, and Transport Science I: Heat Transfer.

Dr. Bonnie J. Bachman, Missouri University of Science & Technology

Bonnie Bachman is a Professor of Economics at the Missouri University of Science and Technology, Rolla, MO. Her areas of research are innovation and entrepreneurship education, impact of innovation on economic development, and sustainability-driven innovation. She is a Faculty Fellow for Innovation and Director of the Missouri NSF/S&T I-Corps Site Program. Bonnie co-leads the Pathways to Innovation initiative with colleague and Entrepreneur in Residence, John Lovitt. She is an adjunct professor in the Executive MBA program at the University of Missouri-Columbia and Visiting Professor at the Beijing Institute of Technology in the International MBA program.

Prior to this position she was Sr. Director, Strategic Technology Deployment and Mechanical Technology for Flextronics International and managed design and development teams in Italy, China and the US. She also had profit-loss responsibility for a 600-person tool making operation in South China. Bonnie was previously employed by Motorola, where she was Director of Emerging Technologies. Her team was involved in wireless product design and engineering, discovery of new technologies for bio-monitoring, and exploring the arena of wearable computer systems. During her 10 years at AT&T Bell Labs, Bonnie was involved with polymer research and development, materials characterization and testing, and plastics processing.

Bonnie has 4 patents, 1 provisional patent, and over 125 publications and presentations.

Bonnie received a BS in Physics from Benedictine University (Lisle, IL), a MS in Mechanics and Materials Science, and a PhD in Materials Science and Engineering (both from Rutgers University, College of Engineering - New Brunswick, NJ). Bonnie holds Distinguished, Fellow, and Honored Service memberships in Society of Plastics Engineering (SPE). She was also President of SPE in 1994. She is a senior member of IEEE and a life member of the Creative Education Foundation. She holds membership in Tau Beta Pi engineering honor society and Phi Sigma Pi honor fraternity.

Prof. Renee Cole, University of Iowa

Dr. Renée Cole is an Associate Professor of Chemistry at the University of Iowa. Dr. Cole earned a B.A. in chemistry from Hendrix College, and M.S. and Ph.D. degrees in physical chemistry from the University of Oklahoma. Her research focuses on issues related to how students learn chemistry and how that guides the design of instructional materials and teaching strategies as well on efforts related to faculty development and the connection between chemistry education research and the practice of teaching. She is a PI for the Increase the Impact Project, which is developing resources for PIs to improve the propagation of their innovations, as well as a PI for the ELIPSS Project, which is developing resources for STEM instructors to assess professional skills in the classroom. Dr. Cole is also an associate editor for the Journal of Chemical Education.

John Lovitt, Wichita State University and Missouri University of Science & Technology

Retired Tech Industry Executive developing people with the skills and wisdom to apply technology for economic and social benefit

Dr. Melissa Geist, Tennessee Technological University

Dr. Melissa Geist is a Professor of Nursing as well as a nationally board certified Family and Pediatric Nurse Practitioner. Dr. Geist received her doctorate at Peabody College of Vanderbilt University. She completed a Post-Doctoral Fellowship with the NSF funded VaNTH Engineering Research Center (a collaboration between Vanderbilt, Northwestern, The University of Texas and Harvard Universities) where

she developed and implemented Legacy Cycles as part of curricular reformation in Biomedical Engineering aimed at increasing flexible knowledge and adaptive expertise of students. In her classes, nursing students engage in critical reasoning and clinical decision making via Legacy Cycle modules on complex topics such as management of anticoagulants, and interpreting arterial blood gas values. She has received the Outstanding Faculty award and the Award for Innovative Instruction as part of the university Quality Enhancement Program. Dr. Geist serves on the strategic committee for the newly designed Innovation and Entrepreneurship (I&E) Certificate offered at Tennessee Technological University. The focus of the I&E program is to provide students the opportunity to develop entrepreneurship and innovation skills through problem solving, creativity, working with a team and practicing effective strategies for meeting needs within the increasingly competitive global marketplace. Dr. Geist serves as the faculty mentor for two nursing students who are University Innovation Fellows by the National Science Foundation Epicenter at Stanford University.

Dr. Charles Henderson, Western Michigan University

Charles Henderson, PhD, a Professor at Western Michigan University (WMU), with a joint appointment between the Physics Department and the WMU Mallinson Institute for Science Education. He is the co-founder and co-director of the WMU Center for Research on Instructional Change in Postsecondary Education (CRICPE). His research program focuses on understanding and promoting instructional change in higher education, with an emphasis on improving undergraduate STEM instruction. Dr. Henderson's work has been supported by over $7M in external grants and has resulted in a many publications (see http://homepages.wmich.edu/~chenders). He is a Fulbright Scholar and a Fellow of the American Physical Society. Dr. Henderson is the senior editor for the journal "Physical Review Physics Education Research" and has served on two National Academy of Sciences Committees: Undergraduate Physics Education Research and Implementation, and Developing Indicators for Undergraduate STEM Education.

Dr. Debra May Friedrichsen ,

Dr. Debra Friedrichsen has an M.BA, an M.S, Ph.D. and several years of industrial experience including a position in sensor development. Sensor development is also an area in which she holds a patent. She has engineering education research focused on 1) feedback and 2) the propagation of educational innovations.

Mr. Phil Weilerstein, VentureWell

Phil Weilerstein is the President and CEO of VentureWell (formerly NCIIA). Phil began his career as an entrepreneur as a student at the University of Massachusetts. He and a team including his advisor launched a startup biotech company which ultimately went public. This experience, coupled with a lifelong passion for entrepreneurship, led to his work with VentureWell. Phil's tenure at the VentureWell is marked by his skill for network-building and expert leverage of resources. He has a special talent for seeking out gifted educators and other important contributors and putting them to work for the betterment of invention, innovation, and entrepreneurship education in the U.S. and worldwide. As an entrepreneur in a non-profit organization, he has grown the VentureWell from a grassroots group of enthusiastic faculty to a nationally known and in-demand knowledge base and resource center. Phil is a founder and past chair of the Entrepreneurship Division of the American Society of Engineering Education and serves as the Deputy Director of the Engineering Pathways to Innovation Center based at Stanford University.

Institutionalizing Campus Innovation and Entrepreneurship Programming by Optimizing a Faculty Grantmaking Process: A Case Study

The number of institutions offering entrepreneurship courses and programs has grown dramatically over the last decade. Many of these programmatic offerings have been driven by the passion of individual faculty champions. Unfortunately, the programming often remains the responsibility of that founding faculty champion. In such cases, if the faculty champion leaves, the entrepreneurship programming declines or may be completely lost.

VentureWell, a not-for-profit that supports STEM innovators and entrepreneurs, has utilized its Faculty Grants Program to provide seed funding to faculty champions to create courses and programs that enhance student development of skills and knowledge associated with innovation and entrepreneurship. To foster lasting impact, the program sets the expectation that meritorious educational innovations will continue after funding ends. While this has occurred in most cases (over the last 5 years 72% of grantees' claim activities have continued, expanded or been institutionalized), continuation of the program typically remains the responsibility of the founding faculty members, an indicator that institutionalization is not yet complete.

Research on propagation and institutionalization of educational innovations has suggested that an institutionalization plan should be constructed in three phases: (i) describe the gap between the current situation and the desired future situation, (ii) prepare a plan for bridging the gap, and (iii) prepare a plan for monitoring progress toward bridging the gap. This paper describes how VentureWell is integrating this three-phase approach to institutionalization, Designing for Institutionalization (DI), into its Faculty Grants program. The DI approach is an adaptation of the three-phase Designing for Sustained Adoption Framework, which supports educational developers to increase the percentage of educational innovations that are propagated beyond the original developers. Case studies of institutionalization efforts provide lessons that could be applied by others interested in institutionalization.

Introduction

Integration of innovation and entrepreneurship into engineering programs supports students' development of skills that are highly sought by employers, including effective communication, problem solving, multidisciplinary teamwork, using diverse contexts and constraints in design decisions, and the ability to innovate.[1–3] Development of these and other entrepreneurial skills, such as flexibility, resilience, creativity, and empathy, improve students' job prospects, their performance in the workplace, and ultimately better prepare them to contribute to today's competitive, global economy.[3–5] As a result, faculty members across the country are increasingly recognizing the value of entrepreneurship education, as evidenced by its growth. Since the 1970s, the number of entrepreneurship-related courses has grown from single digits to thousands.[6]

Despite this growth, Hoskinson and Kuratko claim that universities do not yet meet needs of the competitive, global economy.[7] Although multiple programs have been developed for students in select disciplines, a more inclusive, substantive, sustained, and institutionalized approach must

be adopted to transition from individual programs, often started by innovators, to entrepreneurial educational opportunities that span the entire campus community.[7,8] The pattern in which individual innovation and entrepreneurship programs are developed and show promising results, but do not catalyze sustained, institutional adoption, is similar to other STEM educational innovations. Many educational innovations have been developed and a sizable portion of these innovations have been shown to be effective in supporting student learning, but only a very small fraction of these innovations have been widely adopted and used on an ongoing basis, i.e., adopted and institutionalized. For example, in a 2010 survey of engineering department chairs, Borrego et al reviewed the extent to which seven well-supported innovations in engineering education were used in engineering departments across the country. The study found that the mean adoption rate for these proven educational innovations was 47%.[9]

VentureWell, a not-for-profit organization with a mission to cultivate a pipeline of inventors, innovators, and entrepreneurs to solve the world's biggest challenges, has played a significant role in efforts to seed entrepreneurship educational programming through its Faculty Grants program. VentureWell's Faculty Grants program provides funding to faculty to create courses and programs in which students develop inventive, STEM-based ideas and gain entrepreneurial skills they need to bring them to market. Since 2011, VentureWell has provided a total of 156 grants to 94 institutions, totaling more than $4.5 million in awards. Ninety-four grantees created 220 new and improved courses and 67 grantees created 94 new and improved programs. These courses and programs have engaged more than 14,660 US students and 824 faculty. VentureWell will continue to seed new courses and programs as described above, but also intends to foster institutionalization of innovation and entrepreneurship programs as described by Hoskinson and Kuratko.[7] This paper examines VentureWell's approach, and thus provides insights into the steps project teams can take to promote institutionalization of their entrepreneurship educational programming.

Describing Institutionalization

There are many interpretations of what it means for an innovation to be institutionalized. For example, Rogers (2003) defines institutionalization as the "the degree to which an innovation continues to be used over time after a diffusion program ends" (p. 183), and Hutchinson & Huberman (1994) refer to it as "routinized use."[10,11] For the purposes of this paper, we define "institutionalization" as putting into place new practices or procedures (e.g., redefining how teaching loads are calculated) or significantly modifying existing practices and procedures such that an innovation is likely to continue, even if the originating local champion(s) were to leave.

Federal granting agencies, such as the National Science Foundation (NSF), follow a research model of funding; that is, NSF funds a project team to develop and evaluate an innovation. The underlying assumption of the research model is that if the innovation is good and its effectiveness if supported by sufficiently compelling data, institutionalization will follow.[12] This is the first change model the Foundation Coalition project used in its development of integrated curricula.[13] This model was inadequate for institutionalization of changes in the Foundation Coalition as well as many other situations. What typically happens is the project team writes journal articles, makes conference presentations, and creates a project website.[14] When the grant

expires, the project team transitions to the next research initiative, and the innovation languishes or dies.

Recognizing the challenges of institutionalization mentioned earlier, VentureWell has constructed its Faculty Grant program to explicitly create conditions likely to result in institutionalization. Faculty Grant guidelines state that proposals with a continuation plan are more likely to be funded. Inclusion of a continuation plan indicates that each grantee, also referred to as the faculty champion, indicates intent to continue. As a result, 72% of funded grantees asserted activities have continued, expanded, or been institutionalized. However, inclusion of a continuation plan in the proposal provides no indicators of awareness, engagement, or intent to support the innovation by associated department chairs, deans, or other faculty across the university. Institutionalization, as described above, requires engagement of leadership and stakeholders across campus.[7,15–18] To increase likelihood of institutionalization, VentureWell is seeking to augment its Faculty Grant program to foster both educational innovations for student development of skills for innovation and entrepreneurship, and university-wide engagement likely to lead to institutionalization of the supported innovations. To this end, VentureWell collaborated with the Increase the Impact team, a research project team that has developed resources to improve propagation of educational innovations, to develop a workshop for its grantees to support institutionalization.

Designing for Institutionalization Approach

The Designing for Institutionalization (DI) approach was derived from the Designing for Sustained Adoption (DSA) approach. DSA was developed by the Increase the Impact team based on studies of typical practice and successful practice.[19] The framework is built on a metaphor, where the path to sustained adoption is represented by a bridge that crosses the chasm between the current situation and a future desired situation (in which the innovation is widely used). More details about DSA can be found elsewhere.[20]

The Increase the Impact team has used the DSA framework and accompanying resources, such as the Designing for Sustained Adoption Assessment Instrument (DSAAI), to help developers learn how to plan for propagation. In the DSA framework, propagation has occurred when non-developing faculty use an educational innovation.[21] A variety of developers in different stages of their projects have actively engaged with the framework via facilitated workshops. Prior to the workshop, participants are asked to submit a *structured summary* of a potential education development project. A three-page *structured summary* describes the project in six half-page sections: (i) project overview, (ii) potential adopters, (iii) development activities, (iv) broader impact plan, (v) propagation and evaluation plan, and (vi) project timeline. During the workshop, participants used information and exercises from the DSA book, the DSAAAI, and feedback from peers and the project team to revise their summaries. Attendees provided feedback that the materials and workshops helped them think about propagation differently and that these experiences resulted in positive feedback on grant proposals.

Since both propagation and institutionalization share the goals of expanding adoption of an innovation beyond the developers or faculty champions, strategies for supporting propagation can be adapted for institutionalization. Table 1 compares core components of DSA and DI

approaches. The DI approach, with a modified framework and assessment instrument, is described in the next section.

Table 1. Comparison of the DSA and DI Frameworks

Designing for Sustained Adoption	Designing for Institutionalization
Describe the Gap • Describe the innovation (identify the critical components required for adoption, and what type of change the innovation is.) • Identify potential adopters and their characteristics. Create a description of people who are likely to adopt. • Describe how different levels of the instructional system (individual, departmental, institutional, extra-institutional) influence potential adoption.	Describe the Gap • Describe the initiative (identify key components of the initiative that will be institutionalized.) • Identify key decision makers • Describe aspects of the institutional system that will influence institutionalization. • Draw "maps" of the institution that highlight key features relative to the innovation; one map for the current situation and another map for the desired (future) situation when the initiative is institutionalized.
Bridge the Gap • Develop the innovation interactively. Discuss how to engage potential adopters in development activities • Disseminate interactively. What traditional mass-media methods and methods fostering personal connections between innovators and adopters could work? • Support adopters in their implementations after initial adoption.	Bridge the Gap • Identify key levers/barriers based upon maps of the institutional system. • Test mental models of key levers/barriers (what evidence supports/refutes them as levers/barriers?) • Engage key decision-makers. • Work at multiple levels (department, college, institution) of the institutional system.
Check Your Alignment • Evaluate alignment of propagation activities with available resources and the timeline for the project. • Adjust as needed.	Monitor Progress • Identify and track a set of key indicators, which should be related to the levers and barriers. • Adjust as needed.

Table 1. Comparison of the sustained adoption framework and the institutionalization framework. The institutionalization framework is a modified version of the sustained adoption framework.

Differences between the DSA and DI approach are due, in part, to differences in identifying potential adopters and influences on the adoption decisions. For the DSA approach, work needs to be done because potential adopters are often at other institutions and understanding how adoption decisions are influenced at other (perhaps many) institutions varies from institution to institution. In the DI approach, identifying potential adopters is more straightforward, because they are faculty members in the same department, college, or institution. Then, work needs to be done to identify the key decision makers that influence adoption decisions. Further, in the DSA approach, work is required to engage with potential adopters. However, in the DI approach work shifts from engaging with potential adopters to hypothesizing how institutionalization decisions are influenced, i.e., levels and barriers, and gathering evidence to either confirm or reject mental models of levers and barriers.

Designing for Institutionalization

Soliciting Workshop Participants

The Increase the Impact team and VentureWell worked to integrate the DI framework into its Faculty Grants program. VentureWell Faculty Grants typically offers one cycle of funding each fall. The call for proposals is released each September with an early November deadline. Proposals must include a five-page narrative describing the specific educational innovation being proposed. Applicants must describe how the educational innovation builds upon what already exists on their campus, integrates experiential learning, prepares and supports student e-teams and their technologies towards commercialization, and has the potential for educational, social or environmental impact. While a continuation plan for the educational innovation is not required as part of the narrative, the guidelines emphasize that proposals with a continuation plan are more likely to be funded. Reviewer guidelines also list continuation as one of the criteria evaluated under the heading of institutional commitment. Approximately 20% of proposals are funded. Upon receipt of the grant, recipients commit to providing an interim report one year into the grant, and a final report at the close of the grant; a typical grant concludes after 18 months.

To pilot the DI framework in the context of its Faculty Grants program, VentureWell released an off-cycle call for proposals to a subset of existing grantees that met two criteria: (i) having an active faculty grant and (ii) being part of the Pathways to Innovation program (Pathways). Pathways is a faculty development and institutional change initiative that works with teams of faculty to integrate innovation and entrepreneurship into their campus.[22] The call for proposals was emailed on May 3, 2016 to a total of 24 grantees with a deadline of May 9, 2016 for an emailed letter of intent, and a final proposal deadline of May 20, 2016. Existing grantees were targeted for this pilot because of their ability to qualitatively compare their prior experience with Faculty Grants with this new, pilot approach. In addition, the Pathways program goal of integrating innovation and entrepreneurship on campus ensured applicants' goals aligned with the institutionalization goals of this pilot grant process.

VentureWell framed the call for proposals as an opportunity to extend work already begun. In three pages or less, applicants were asked to describe how they (1) would use the additional funds to increase the impact and sustainability of their work, and (2) planned to measure their outcomes. Applicants were also notified that, as grant recipients, teams of at least two people, including the Principal Investigator on the grant, were required to attend the workshop to plan for institutionalization of their educational innovation.

Thirteen complete applications were received. A team of external reviewers selected seven applications for funding using criteria that included the degree to which the application demonstrated progress from the date of their original grant, impact and sustainability of their proposed approach, expanded engagement of their proposed approach, sufficient description of their target audience, and clear articulation of plans to measure outcomes. Given the focus on institutionalization of these grants, the two criteria (1) impact and sustainability and (2) expanded engagement, accounted for 65% of the weight in scoring of these proposals.

On July 1, 2016, VentureWell applicants notified of the status of the proposal, and shortly thereafter, a save the date email was distributed with dates to register for and attend the Increase the Impact workshop (October 9-10, 2016). In addition to registering for the workshop, applicants were asked (August 29, 2016) to complete the DI template prior to the workshop and participate in the kick off webinar (August 31, 2016). During the webinar grantees learned more about the DI framework and the use of the template.

Preparing for and Hosting the Workshop

The process started by asking teams to complete the DI template (Appendix A), a modified version of the DSA structured summary. A completed template provided an overview of their project; key players; levers, facilitators and drivers of the project (those processes, individuals and factors that will help promote the project); potential sources of resistance; activities to be undertaken to leverage drivers and mitigate barriers; timeline for all activities with a view to appropriate sequencing; evaluation or plans for demonstrating outcomes. These categories were selected to help project teams articulate their understanding of the different aspects of the instructional system that impact adoption and sustainability of educational innovations, specifically in the context of their grant-funded initiative. The template also provides a condensed format for teams to articulate what institutionalization meant to them, and how that definition impacts drivers, barriers and activities undertaken. Prior to the workshop, teams could ask clarifying questions about the template, both during the kick-off webinar and via email. Teams submitted their completed templates prior to the workshop so that workshop facilitators could evaluate them and provide feedback at the start of the workshop.

Templates were evaluated using the *Designing for Institutionalization Assessment Instrument* (DIAI) (Appendix B), which was based on the DSAAI.[21] The first section of the DIAI describes key characteristics of the entrepreneurial programming to be institutionalized. This section is more open-ended in the DIAI than the DSAAI to accommodate variations in initiatives being undertaken. The second section is also descriptive, but the focus is on features of the initiative that relate to how much and what type of effort will be required for institutionalization. In this section, the primary difference between the DIAI and DSAAI was addition of a category related to the degree of formal approval or policy changes required for institutionalization. The last section is evaluative in nature and focuses on aspects of institutionalization strategies influencing likelihood of success. The modifications in this section of the DIAI, compared to the DSAAI, parallel those made in the template. Rather than identifying intended adopters, the focus is on key decision makers. Changes to rubric categories assessing institutionalization strategies presented in the template were minimal, mostly changing propagation to institutionalization. To address expectations that grantees provide evidence of institutionalization, a category related to metrics to monitor progress towards institutionalization was added.

During the workshop, facilitators presented information about the three-part DI framework that sits underneath the template: Part 1: Understand the Gap; Part 2: Bridge the Gap; Part 3: Monitor Progress. Part 1, Understand the Gap, intends to help teams clarify their project and goals from an institutionalization perspective, e,g., describing the university systems they must interact with to institutionalize their project. Team members began this process by individually articulating up to three key components that they believed would be institutionalized. Team members then

shared their three components with each other, finally reaching consensus regarding the goals of their initiative. Teams next described the university systems with which they must interact. They began by identifying the various cultural and structural systems of the university at the level of individual, units/department, colleges and then the entire institution. A map was then constructed by each team demonstrating what these cultural and structural systems look like now, versus in the future, when their initiative is institutionalized.

Part 2, Bridge the Gap, guided grantees through developing institutional maps to identify levers and barriers to institutionalization. Grantees then refined institutionalization strategies using these levers and barriers. As a part of this process, teams are also encouraged to test aspects of this mental map to ensure that the levers and barriers exist as described, and can thus be leveraged as outlined. Finally, in Part 3, Monitor Progress, grantees identified key indicators of progress towards institutionalization, which included both structural impact, e.g., changes to the curriculum or pedagogies, and cultural impact, e.g., changes in conversations and relationships of stakeholders.

Throughout the workshop, teams utilized their new insights resulting form peer and facilitator feedback, to refine their templates. Following each revision, individual team members evaluated one other team's template using the DIAI. This rubric emphasized clarity, requiring that readers of the template understand the components to be institutionalized, size and specifics of the gaps to be bridged at each university, the specific strategies to be leveraged to bridge that gap, and metrics to measure the progress towards institutionalization. This process is designed to foster clarity of intention and strategies adopted. Additionally, towards the end of the workshop, peer groups were formed comprising 2 teams. These peer groups provided supplementary verbal feedback and answered questions regarding their evaluation of the other team's template.

Workshop Follow-up

Following the workshop, teams revised their templates and then met via videoconference in peer groups comprising two teams, two Increase the Impact facilitators, and a VentureWell staff member. Prior to the meeting, team members and facilitators used the DIAI to evaluate submitted templates. During the peer group meeting, participants reviewed and discussed aggregated evaluations, and suggested strategies for driving each initiative forward. At the close of each meeting, teams were asked about next steps. Team members recommended we meet every 2 months, with up to 3 teams per meeting. Meetings would provide an accountability and check-in mechanism, and foster sharing of best practices among schools. A second round of peer group meetings were subsequently held, at the close of which teams continued to express interest in additional peer group meetings, and recommended the design and use of a dashboard for efficiently monitoring progress towards institutionalization.

Case Studies

The following subsections present three case studies at three institutions: California Polytechnic State University, San Luis Obispo; Missouri University of Science and Technology; and Tennessee Technological University.

California Polytechnic State University, San Luis Obispo (Cal Poly)
Written by Thomas Katona, Assistant Professor, Biomedical Engineering

Description of Innovative Entrepreneurial Programming

Cal Poly received an initial course development grant from VentureWell that started in August 2015. The grant was focused on developing a yearlong interdisciplinary and entrepreneurial senior design capstone sequence. The course was to include students from the colleges of engineering and business, and was focused on student-initiated entrepreneurial projects, and specifically potentially high growth entrepreneurial projects. Table 2 below outlines the characteristics of Cal Poly's existing capstone design offerings before the initial grant award i.e. a multidisciplinary course that engages students from six engineering disciplines, and a single discipline course ("Current Courses"). The table below compares these current courses compared with the proposed interdisciplinary course. This proposed course, particularly the cross-college aspect, was unique to Cal Poly, and from our discussions with many institutions at national conferences, also seemed to be fairly unique at other institutions, although some examples were found. Among peer institutions, cross-college interactions tended to be handled via informal mechanisms as opposed to formalizing them in the curriculum.

Table 2: Outline of the key differences between the proposed capstone course and the existing capstone opportunities available at Cal Poly.

	Current Multidisciplinary Engineering Course (Laiho, 2010)[23]	**Current Single Discipline Courses**	**Proposed Interdisciplinary Course (Engineering, Business, Design)**
Teaming Structure	Teams assigned by faculty	Teams assigned or individual projects	Team formation by students
Project Scope	Project scope defined	Project scope defined	Creativity and ideation define starting assumptions
Opportunity Identification	Requirements from industry sponsor	Requirements based on engineer's desires	Lean Startup methodologies
Customer Discovery	No customer contact	No customer contact	Customer development as continuous process
Engineering Methodology	Waterfall engineering	Waterfall engineering	Agile engineering
Product Development	Design/build/test	Design/build/test	Iterative prototyping
Funding	Industry Sponsor	Internally supported	Venture Well in years one and two, alumni following years

The new interdisciplinary course was launched in the fall of 2015 and 73 students participated. Forty-three students were from our college of engineering, twenty-six from the college of business, and one from the college of agriculture. We also had 3 additional students

that joined teams and participated in the class without receiving credit. Participating students formed 11 interdisciplinary teams. Their projects included 6 hardware and 5 software-based projects, each of which was initiated by the students and represented a potentially scalable growth venture.

We attempted to informally involve students from our art and design program in the college of liberal arts in the projects by collaborating with a faculty member that had previously received a faculty fellows grant through our Center for Innovation and Entrepreneurship. We wanted to include design students due to an overarching desire to build more diverse teams, along with a specific goal to add students that could help with front-end design of software projects and aesthetic appeal of the hardware projects, and to have students that would focus on consistency of design and brand across the entire venture the students were working to create. The art and design faculty member integrated logo design/branding, and collateral creation for about half of our projects as a multi-week project assignment for a sophomore level design course. While this was a positive first step in working to add students from the college of liberal arts into our course, we noted that the interaction with the design students was very disjointed and did not have the impact that we would expect from a truly integrated curricular experience. The two main reasons for this were, first, that the design students were not truly a part of the teams and the entire design process, but rather acted more like subcontractors. Secondly, we believe, although are less certain of this aspect, that the second-year students approached the project differently than our seniors. The difference was not competency, but rather expectations regarding what they personally wanted to get out of this particular experience. Many of the seniors were hoping to either potentially launch a venture at the end of the year, or have a novel project-based design experience they could relay to potential employers; by comparison, the design students approached it as one assignment among many in several introductory classes they were taking.

Steps toward Institutionalization

Based on the success with the first year of the interdisciplinary cross-college senior capstone course, our desire to overcome the challenges we had working with design students that were not integrated into the course, and our eligibility as one of the Pathways to Innovation Program Universities to apply for funding to expand the program, we applied for a supplemental grant from VentureWell in May of 2016. This grant was awarded in July 2016. The primary scope of the grant was to:
  • Develop a mechanism to formalize a curricular path for students from our design programs in liberal arts to participate in the capstone course
  • Expand the number of sections of the course that would be offered

Before attending the fall 2016 Increase the Impact workshop, the engineering faculty teaching the course completed the initial draft of the DI template. The process of our teaching team doing this together helped us more thoroughly define our key challenges, and more importantly, the key individuals we needed to work with to overcome these challenges. While the two members of our team had approximately 80% overlap in our original inputs to the template, each person had items with different areas of focus, and due to past experiences, each had unique knowledge of the proper decision makers for certain issues. For example, while ongoing funding for the

course was a clear concern for the team, one team member focused on operating expenses for course/project materials and supplies, while the other team member focused on expenses for additional faculty time. Each set of expenses is necessary and each interests different stakeholders and decision makers on campus.

In addition to being conscious about getting multiple inputs when mapping out the key tasks and barriers for institutionalization, the team found that the process of consciously taking time out of the normal schedule (approximately 48 hours away from our home campus) to reflect specifically on institutionalization of the grant, was helpful to change the team's mindset on the importance of different activities, and increase the commitment to institutionalization. While this may seem obvious, it's not uncommon to get overwhelmed with implementation and execution of the actual grant activities without being conscious of what needs to be done during the execution stage to ensure that the activity will persist beyond the life of the grant. We found that the four key aspects that helped with this process were:
- Pre-workshop preparation time with the teaching team
- Dedicated time
- Change of location
- Feedback and discussion with peers from outside the institution

While the benefit of dedicated time was highlighted above, we found that having this workshop away from campus was helpful. There is a growing body of literature pointing to the need for groups to have so-called "other places", particularly when working on innovative projects that may be counter to the prevailing culture of an organization.[24,25] While we do not claim that this activity strictly follows the models that have been reported around corporate intrapreneurship, we do believe some of the benefits seen by groups working in these other places similarly helped our time of reflection and planning. Lastly, it helped to get input from peers from other institutions. Just as members of our team highlighted different areas and individual stakeholders that would be important or necessary for our institutionalization efforts, individuals from other institutions, with extremely different contexts, sometimes had either different perspectives that we could learn from, or had already implemented something on their campus that we could utilize in our efforts. While some inputs are not applicable because of contextual differences between campuses, as a whole, peer input and interaction were helpful. One suggestion that our team discussed was that it would have been helpful to have spent more time with the teams from peer institutions, to better understand their campuses and their projects. We learned more about clarity of our stated objectives and challenges from our dialog with them, as compared with only receiving written evaluations of our template using the rubric, or from listening to their feedback without being permitted to respond. With that said, the process of only listening to feedback on the written template from our peer institution did require us to focus on listening to their comments as opposed to trying to respond to them. A model that incorporates both modalities of feedback would have been helpful as we found ourselves discussing with the peer institutions during breaks and off hours to try to gain context on each other's projects.

In summary, dedicating time to design a plan for campus institutionalization before grant implementation can provide great value and intentionality for a grant awardee to maintain focus on not only grant execution, but being mindful of sustaining the impact of a grant beyond the award period. In considering the approach outlined here and the expected results from this early

reflection, further work is needed to evaluate both the lasting institutionalization results, as opposed to expected results. It will also be critical to determine the optimal methods for creating the type of environment that leads to lasting institutionalization such that grants provided are not overly financially burdened by the costs associated with the process of thinking about and planning for institutionalization.

Missouri University of Science and Technology Case Study
Written by Bonnie Bachman, Professor, Economics, and John Lovitt, Entrepreneur in Residence

Description of Innovative Entrepreneurial Programming

Since 2014, Missouri University of Science and Technology, with the support of three VentureWell Faculty Grants and the Pathways to Innovation program, began a journey to build a strong innovation and entrepreneurship (I&E) culture, and develop programs and related activities. It was an aggressive strategy with the first effort focusing on the development of a Lean LaunchPad (LLP) Experiential Entrepreneurship course, which was supported by our first VentureWell Faculty Grant. This initial course led to the development of a minor program including four I&E required courses, which was supported by our second Faculty Grant.

As we added more interdisciplinary experiential team projects to the courses we were offering, it became apparent that communication and team skills were lacking, and faculty struggled with team dynamics and how to get teams back on track. As one professor observed, "the usual four person 'team' has one driver, two passengers, and a flat tire". Also, while there is usually a reflection component to projects, it is typically focused on the technical aspects (the what) of the project, and not much on the interpersonal dynamics and team effectiveness (the how). The LLP and design thinking methodologies that we were integrating require careful observation and listening, and thus also demonstrated the need for better communication skills. In addition, we engaged several industry advisory boards, employers, and alumni to understand what capabilities they would like to have developed in our graduates, and consistently found that communication and collaborations skills are very high on their lists.

In the courses we developed and delivered, we took steps to empower our students to engage in peer mentoring. Feedback from students, class mentors, and teaching team members, indicated there is untapped potential in applying this peer mentoring approach to communication and collaboration skill development. Our intent for the third Faculty Grant was therefore to add drop-in modules that could be utilized in all of our courses, which focused on using observation and later feedback loops as part of the skill development methodology, while simultaneously bolstering communication skills. Peer mentoring is also a common aspect of employer cultures today, so its inclusion in the classroom better prepares students for this approach post-graduation. In addition to the drop-in modules, we also wanted to develop a way to assess observation and feedback midway, and at the end of the semester-long project. Critical to this effort is that the assessment approach implemented should be applicable to a wide variety of courses in both Colleges (Engineering and Computing, and Arts, Sciences and Business).

An added explicit objective of the program development effort is to foster an entrepreneurial mindset in students. We adopted what we view as the KEEN definition of mindset, i.e., curiosity,

connections, and creating value. While each of these features applies to the technical aspects of the projects in the courses, they are also relevant to the human aspect of understanding the users of your technology, your teammates, and yourself. For example, it is through curiosity, which engenders observation and listening, that students come to understand their own as well as other team members' personal interests, constraints, perspectives, and the context in which they operate, as well as team and stakeholder interactions. In addition, curiosity enables students to see connections needed to construct the right solution to their problems, or open new opportunities to create value.

Steps toward Institutionalization

The third Faculty Grant awarded and the Increase the Impact workshop came 2½ years into our journey, when we realized how extensive the initial project had become, and how critical it was to gain full support for a comprehensive program that has the people, processes and tools to accelerate application of technical innovation for social and economic impact. Had it come earlier, we may not have understood the breadth and depth required for fundamental institutional change.

We found the Increase the Impact workshop helpful because it convened institution-based teams who were familiar with each other from Pathways or other VentureWell programs. The Increase the Impact approach was also useful because teams were encouraged to share their approaches. Reviewing other university institutional plans helped highlight issues we had not uncovered with our own effort. We found the template for outlining our goals and thinking about institutionalization to be particularly helpful and will adapt it for future programs.

Following the Increase the Impact workshop, we continued the planning process and focused on achieving roll out of the observation and feedback module on a small scale. Without the planning effort, we would have made a common mistake, start big to show impact. Currently, we have introduced the observation and feedback module to one section of ME 1720 (Introduction to Engineering Design). A Likert-based survey to probe aspects of team dynamics, team functions, and feedback effectiveness was created and will be used midway through and at end of semester. A section of the survey instrument will ask for written comments on observation. Starting in the Fall 2017 we will roll out the module to all 11 sections of the course. We are currently introducing observation and collaboration concepts into the Electrical and Computing Engineering 2-semester senior design course and the survey instrument will be introduced the following semester.

While we did find the DI approach useful, it could be improved. For example, an online curriculum, delivered prior to the in-person workshop, could be developed to help participants understand the methodology, and complete and evaluate the DI template. The in-person workshop could then reinforce learning and provide more time for cohort interaction and individual team planning. Since this was the first time the DI approach and materials had been used, we found that the teaching team struggled, at times, to communicate the concepts and run the workshop. Lessons learned from this iteration, could be used to strengthen future workshop delivery. Examples of institutionalization success stories, sharing of research citations regarding educational program institutionalization, and one-on-one mentoring sessions with Increase the

Impact Team could also be integrated to inform and scaffold the institutionalization plans developed. Finally, follow up meetings, which are already underway, will be important to discuss progress.

While the approach was useful for our team, not all schools are necessarily interested in, or ready to build towards, greater impact and institutionalization across their campus. Others considering adopting this approach should determine whether the grant goals align with institutionalization, and whether grantees are ready for and interested in institutionalization.

Tennessee Technological University (TTU)
Written by Robby Sanders, Assistant Professor, Chemical Engineering and Melissa Geist, Professor, Nursing

Description of Innovative Entrepreneurial Programming

TTU received initial VentureWell Faculty Grant funding to support the development and expansion of a "Clinical Immersion at Disciplinary Interfaces" 3-credit hour course. This course immerses junior and senior nursing and chemical engineering students in a healthcare environment where the teams look for problems and accompanying solutions that can improve healthcare. The course is co-taught by a faculty member in the TTU School of Nursing and a faculty member in the Department of Chemical Engineering. The initial concept for the course grew out of on-going discussions between the engineering and nursing faculty who were both interested in interdisciplinary courses and recognized the value of interdisciplinary teamwork in solving complex problems. A Faculty Grant along with support from the university's Quality Enhancement Plan provided the critical seed funding to allow the team to develop, offer, and expand the course. At the same time, the university's innovation and entrepreneurial ecosystem was rapidly growing with the development of a university makerspace, which created a logical space for prototyping. The second round of funding from VentureWell established critical support to expand the efforts and move towards institutionalization.

Since first being offered in the fall of 2015, the course is now in its fourth iteration. To date, 37 students have completed the course (19 nursing students and 18 chemical engineering students), and an additional 19 are currently enrolled. Eleven prototypes have been developed covering such topics as spaghetti syndrome (the tangle of tubes that are often encountered in a patient room in the Intensive Care Unit), exposure of healthcare providers to radiation, a novel catheter design addressing an issue with inappropriate use of indwelling catheters outside of a hospital setting, new designs on feeding tubes, and a prototype focused on preventing inadvertent needle sticks, an all too common occurrence in healthcare.

Both faculty members participate in each class which is offered in an approximately 3 hour block once a week with the first half of the course largely centered on the identification of a problem to solve, and the second half focused largely on design and prototyping. More specifically, students are introduced to nursing fundamentals early in the semester and spend about 20% of the overall class time in a clinical environment (e.g., hospital, cardiac device clinic, paramedic training site, lifeflight station, etc.) where they are coached to look for problems (or opportunities for innovation). Once an opportunity is identified, the teams design, build, and test prototype

solutions. At the end of the semester, the teams present their prototypes and the process for identifying and solving the problem to stakeholders and external experts.

A barrier that was recognized during the first two course offerings was that development of prototypes did not advance once the course was complete. Comfort with prototyping was one area that was identified as problematic and one of the reasons prototyping did not continue beyond the life of the course. Thus, the opportunity for additional funding provided a mechanism to allow the instructors to explore new strategies for facilitating the development of prototypes and continuing efforts beyond the life of the course. The use of mobile carts with bins containing a variety of prototyping supplies (e.g., glue guns, straws, paper clips, scissors, and many more items) was recognized as a potential tool for increasing comfort. In addition, leveraging the know-how and energy of the University Innovation Fellows was another area for focus. The University Innovation Fellows program empowers students to become agents of change at their schools. The low budget prototyping cart allows students to design and build in a three dimensional space using common household items, hobby supplies, and tools. We are exploring the possibility of placing these design carts in the hospital or other healthcare facilities, thus expanding access to clinicians in the field.

Steps toward Institutionalization

The DI approach provided a systematic and iterative process for institutionalizing our project so that it might become an integral and highly valued part of the campus culture. The team completed the DI template prior to the workshop, which challenged the faculty to identify key players, drivers and sources of resistance, as well as measurable metrics indicating success. Through robust peer evaluation of the templates using a standardized rubric at the workshop, and continuing via web-based meetings, the DI process forced the teams to think deeply about what is required to firmly root the various approaches on the respective campuses. Specifically, directly related to these interactions, the TTU team has since been increasing its outreach to local industries and has contemplated ways to involve influential personnel (dean, provost, president) in the course in authentic ways.

In the context of the workshop, the process of identifying "what was to be institutionalized" was useful. In reflecting on this topic, the team from TTU brainstormed and considered a variety of scenarios for institutionalization. Through the feedback and interactions in the workshop, the team decided that to maximize the impact of the efforts and this proven approach, it would be useful to consider how this interdisciplinary, immersive approach might be adopted by disciplines outside of nursing and chemical engineering. Rolling out such an approach in the context of the university's growing I&E ecosystem, which includes a thriving makerspace, could lead to student-generated technologies and new intellectual property.

In the context of the workshop, we found it incredibly useful to understand the gap between the current state of our project, and our desired future state, and from there design strategies to overcome those gaps. Also critical is the process for ongoing monitoring of progress to continually push the projects forward.

Additionally, during the workshop, we benefited from reading and critiquing other teams' templates, as well as receiving valuable feedback from other workshop attendees. The other teams identified problems or opportunities for improvements to our plan that we would never have considered. For example, other teams helped us realize there were resources or changes in departmental and university policies that could make it much easier to launch more courses that bring different disciplines together for real-world immersion experiences. Prior to this interaction, we did not fully realize the potential for broader impact of our work on growing the I&E ecosystem at TTU.

The institutionalization goal of engaging other disciplines in this interdisciplinary immersion-based approach is already underway. Table 3 below demonstrates the key instructional elements of the approach, and how they are operationalized in the context of the nursing and chemical engineering class. This represents the beginning of a road map for faculty from other disciplines that might want to adopt this approach.

Table 3. Key instructional elements of the clinical immersion class, and how they are operationalized in the context of the nursing and chemical engineering class.

Key instructional course design elements	TTU Immersion Course
Team formation and discussions of high performing teams	Faculty selection of teams based on known student strengths and weaknesses; Teamwork contract
Efforts to demonstrate context	Examples of healthcare issues including IV catheter replacement and medication dosing errors to children
Authentic immersion experience	Hospital units (CV, CV-ICU, ED, etc.); medical helicopter (life flight) base; device clinic; paramedic training site; nursing fundamentals lab
Exposure to prototyping	Participation in an activity involving mobile carts with prototyping supplies (rapid conceptualization of simple prototypes); Orientation to the makerspace and experiential activities in this environment
Problem identification and definition	Discussions on situational awareness (*e.g.*, keeping one's radar up to look for an opportunity); Guiding questions and prompts for immersion experiences; Post-immersion debriefings; Reiterative peer-review concerning the problem identified and early designs; seeking multiple perspectives
Design challenge project	Interdisciplinary student-driven identification of a problem (including solution) as well as reflection on the process
Presentation to stakeholders	Team presentations at the end of the semester showcasing their design challenge project; stakeholders include healthcare, engineering, and business experts

Outcomes realized demonstrate the effectiveness of this approach. However increasing the opportunities for interaction and communication among grant recipients could optimize the approach. It would also have been useful to have access to the rubric ahead of time so that it might be used when preparing templates or when otherwise considering efforts towards

institutionalization. Additionally, follow-up virtual meetings should continue because these have been tremendously helpful.

The TTU team recommends this approach be implemented across all VentureWell Faculty Grants. The combination of completing the template before the workshop, participating in the workshop, and being involved in follow-up virtual activities has been eye-opening, and has greatly positioned the TTU team to truly increase the impact of its efforts.

Discussion

This paper has presented the DI approach, which faculty members, who developed entrepreneurship and innovation programs with support from the VentureWell Faculty Grants program, used to prepare a plan for institutionalizing their projects. This section will refer to these faculty members as faculty champions. It also presented information on how faculty champions engaged with the process and what they learned. Since it has only been five months since the workshop, it is too soon to collect evidence on the extent to which these programs have become institutionalized. Nevertheless, some preliminary insights can be offered based on the experiences of the authors. These insights might be useful to faculty champions at other institutions, or organizations that provide grants to spur the development of educational innovations.

The faculty champions found the DI process helpful in multiple ways. The completion of the DI template, which included their definition of institutionalization, along with the key stakeholders, barriers and levers, encouraged faculty champion teams to move beyond the day-to-day execution of their grant, and focus some of their energy on the design and execution of a long-range plan for institutionalization. While the design of the DI template was critical in helping faculty champions articulate the key features of their institutionalization plan, the process of engaging a team of faculty from a single institution in this process, and requiring that those faculty attend an off-campus workshop, helped ensure teams developed a more nuanced plan. This approach meant that time was set aside for the faculty team to work together on their institutionalization plan, free from the distractions of a typical campus workday; the team was able to iteratively refine their plan, each team member adding their perspectives and experiences, ultimately lending a depth and complexity to the plan that otherwise might not have been present.

The process of each faculty champion giving and receiving feedback utilizing the DIAI also proved valuable. This process not only pushed the teams to more clearly articulate their plans, it also provided them with examples of levers that have been successfully utilized to overcome challenges on other campuses, that they too might adopt or adapt on their own campus. In addition, exposure to each teams' definition and operationalization of institutionalization encouraged teams to reflect, refine and in some cases pivot on their own definition and plan. All faculty champions attending the workshop emphasized the value of the peer feedback, which ultimately resulted in continuation of this process online. These online peer group meetings foster the ongoing exchange of knowledge, and provide a forum for faculty to seek the guidance of the group, be that with regard to overcoming challenges to institutionalization, or on the execution of their educational innovation. Finally, these scheduled meetings provide a much

needed accountability mechanism, which is critical to faculty that are trying to balance multiple priorities.

However, while faculty champions found the process helpful, the faculty champions and the Increase the Impact team also articulated areas for improvement. Although the Increase the Impact team had experience offering the DSA approach to participants at both face-to-face and online workshops, they found that helping teams from the seven institutions disentangle project activities from the components/process to be institutionalized was more difficult than they expected. They observed that it was hard for teams to step back from day-to-day grant activities and their grant project goals to think about the big picture and what institutionalization meant. Feedback from faculty champions indicated this might be due to the complex nature of institutionalization and the challenge of untangling the idea of institutionalizing a specific project within the innovation and entrepreneurship ecosystem versus the institutionalization of innovation and entrepreneurship as a whole. As previously mentioned, all faculty champions engaged were also from Pathways institutions and thus had a goal of institutionalizing innovation and entrepreneurship in this much larger sense. Thus while it is important for teams to articulate what institutionalization looks for them, it might be useful, in future workshops, to guide teams to focus on the institutionalization of a single project.

In addition, it was much easier for teams to identify barriers than to identify levers and drivers. It also appeared to be challenging for teams to shift from thinking about key players in terms of doing the work of the grant, to key decision makers who would influence institutionalization. More resources might help support faculty champions with the process of identifying key decision makers and the levers that drive change to enable them to develop better strategies to achieve institutionalization. One possible form the resources might take is a guidebook, similar to the book developed for the DSA approach.[20] A guidebook would provide specific questions for faculty champions to ask themselves and examples of answers to these questions by groups that had successfully institutionalized their educational innovations. Basically, a guidebook would help scaffold faculty champion thinking, and expand their list of optional strategies and tactics beyond their own experience, to be more consistent with best practices as informed by work on organizational change and change theory.

Another challenge that the faculty champions at the workshop had was developing metrics with which to assess their progress toward institutionalization. Therefore, another potentially useful set of resources would be more ideas for these metrics. A starting point might be to compile metrics that were generated at the workshop, abstract out institutionally-dependent elements, and start a shared, editable resource that would could evolve over time as more faculty champions at more institutions engage with the DI process and generate more metrics as well as describe scenarios in which the metrics might be useful.

Case studies that provide concrete examples of different types of initiatives are also generally helpful to people and might further scaffold faculty champion efforts. Based on feedback from faculty champions, case studies that discuss approaches for working with stakeholders, overcoming resistance, securing funding, and metrics for measuring institutionalization outcomes would be particularly useful. The inclusion of successfully completed templates in the context of these case studies was also deemed important. The faculty champions participating in

the inaugural DI process might provide the starting point for this collection of case studies, for use with subsequent faculty champions.

As described above, faculty champions are seeking, among other things, best practices for engaging with stakeholders and overcoming resistance. They are also seeking ways to educate and forge alliances with stakeholders, and particularly administrators that can serve as either sources of resistance or strong allies. A DI Guide, designed specifically for administrators, might therefore be developed, that outlines how administrators can accelerate the progress towards institutionalization. Such a guide might be accompanied by a letter highlighting the important institutionalization work being undertaken by their campus faculty champions.

In addition to providing written materials to scaffold faculty champion efforts, faculty champions also felt strongly about the importance of maximizing the very beneficial interactions among faculty champions from different institutions. This could be achieved through an online pre-engagement approach with faculty champions. For example, initial information about the DI approach could be presented virtually. Additionally, faculty champions could be introduced to both the template and the rubric virtually, and encouraged to complete the first cycle of template completion and peer feedback prior to the in-person workshop. This approach would begin the process of engagement with the materials and the peer review process early on. It would also free up time during the in-person workshop for additional communication and feedback among faculty champions from other institutions. Finally, it would ensure that faculty champions more fully understand the standards, as set forth in the rubric, which their templates will be measured against.

Based on the experience at the workshop, the Designing for Institutionalization Assessment Instrument (DIAI) should remove the category "amount of modification expected," because it didn't quite fit many of the initiatives. In DSA workshops, the category works for teams developing a particular teaching strategy or materials; however, the seven teams of faculty champions at the VentureWell workshop did not seem to find it helpful. Instead, interpreting this category caused them a lot of confusion and they did not find their learnings from evaluating an institutionalization plan with respect to this prompt to be very informative. This was not the case for the other categories in the DIAI.

For faculty champions, efforts do not end at the close of the workshop; after the workshop the tough, implementation work begins. It is therefore critical that faculty champions be provided with resources and a sustained process that helps drive their work forward. While the template and rubric were incredibly useful for helping faculty champions identify and articulate their institutionalization goals and metrics, it was determined that a different kind of approach was needed to foster forward momentum and keep focus on the nuances of institutionalization. Online, peer-based meetings will therefore continue to provide a check in or accountability mechanism, help keep teams on track, and foster continued peer support, feedback and sharing of best practices. Additionally, a strategy map, which is modeled on strategy maps used in Strategic Doing, has been developed and will be piloted. Strategic Doing is the agile strategic planning process used in the Pathways program.[26] This map is designed to provide teams with an institutionalization dashboard for documenting and sharing their progress and challenges, as they move towards institutionalization.

Limitations/Future Research

At the time of writing, only five months have passed since the faculty champions first engaged with the DI approach described in this paper. This process appears to have increased faculty champions' understanding of, and ability to articulate, their institutionalization goals and processes. Faculty champions profiled in this paper have also taken important steps towards institutionalization. However, it is too soon to fully assess how the DI approach will ultimately impact institutionalization, a process that might take years to complete. A longitudinal approach that documents grant outcomes, particularly as they pertain to institutionalization, is therefore recommended, along with analysis of a comparison group of grantees not yet exposed to the DI approach. Given the small sample size of only seven institutions, it is also recommended that the approach be introduced to other grantees and their outcomes be similarly assessed to ensure the results observed are generalizable.

Conclusions

While there are literally thousands of entrepreneurship courses nationwide, these courses are created by, and typically remain the responsibility of an individual faculty champion.[6] This approach means courses are often siloed and only open to students from select disciplines. Most courses are also not yet institutionalized, which means they may become unavailable if the faculty champion leaves.[7,8] This paper discusses the Designing for Institutionalization (DI) process, which was designed to overcome these challenges by engaging teams of faculty grantees in a process for integrating and institutionalizing their educational innovations into the fabric of the campus.

It is only 5 months since the faculty teams first engaged with the DI process, but early feedback from faculty champions indicates the usefulness of this process. More specifically, faculty appreciate the use of the DI template as a framework for thinking about and articulating their institutionalization plan. Also critical is the dedicated time away from campus to work with their campus team on plan iteration. Finally, the giving and receipt of feedback to and from other faculty teams using the DIAI provides insights into metrics for measuring outcomes, levers that might be utilized, approaches for overcoming challenges, and alternative conceptualizations for institutionalization that might be adopted.

However, this pilot intervention demonstrated the need to scaffold the faculty experience with guidebooks and case studies of best practices. The process might also be improved by front-loading the experience with an initial online introduction to the DI process, which would mean the in-person workshop might focus on cross-team interactions and refinement of institutionalization plans. Additionally, ongoing, online peer meetings that utilize an institutionalization dashboard could provide an important venue for exchanging ideas and fostering forward momentum.

While this approach proved valuable to the seven teams engaged, it will be important to continue to follow the progress of these teams to determine whether this early-stage feedback and progress results in institutionalization. VentureWell will also need to determine whether the DI approach

ought to be implemented across all VentureWell grants or whether it be reserved for grantees that have already designed an educational innovation and are thus ready to focus on institutionalization.

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Appendix A

Designing for Institutionalization of Educational Innovations Template

Project Overview (½ page)

Explicitly state project goals. Also, provide a brief description of the initiatives that have been started. Describe what it is that you want to be institutionalized (teaching approach, course, etc.). The purpose of this section is to provide context to understand the initiatives.

Key Players (⅓ page)

Describe what it means to be institutionalized, i.e., what processes need to be changed, who needs to approve what, who needs to practice what, etc. Detailed descriptions of the key decision makers and potential adopters are encouraged, together with rationales for identification of potential adopters and decision makers.

Levers, Facilitators, Drivers... (⅓ page)

What processes, individuals, factors… will help promote institutionalization?

Potential Sources of Resistance (⅓ page)

What are key reasons why the initiatives would not be institutionalized?

Activities (⅔ page)

What strategies and tactics will you use to leverage drivers and mitigate barriers?
Who specifically will be responsible for initiating and managing these activities?

Timeline (⅓ page)

When will you do which aspects of the project? Are activities that will take time to come to fruition being started early?

Evaluation (⅓ page)

What metrics will you use to determine success and/or progress?

Appendix B

Designing for Institutionalization Assessment Instrument

Introduction

The Designing for Institutionalization Assessment Instrument (DIAI) is divided into three sections:

1. Type of Initiative (Descriptive)

This section focuses on identifying the key components/processes that will be institutionalized.

2. Features of the Initiative (Descriptive)

This section focuses on identifying features of the initiative related to how much and what type of effort is required for institutionalization. It is important to identify these features because the strategies must be aligned with the nature of change required to achieve institutionalization.

3. Aspects of institutionalization strategies that influence the likelihood of success (Evaluative)

This section focuses on identifying the degree to which the project plan has used strategies that are necessary for or supportive of successful institutionalization. In this section, a low score indicates that there is little evidence that the project team is following best practices and a high score indicates that there is clear evidence that the project team is following best practices.

The intention is that the entire project plan will be used to provide evidence for the analysis of institutionalization strategies.

Designing for Institutionalization Assessment Instrument

I.   Type of Initiative (Descriptive)
Identify key components/processes that will be institutionalized

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II.   Features of the Initiative (Descriptive)
This section focuses on identifying features of the initiative related to how much and what type of effort is required for institutionalization. It is important to identify these features because the strategies must be aligned with the nature of change required to achieve institutionalization.

Factor	Unable to Rate	A	B	C	D
F1. Amount of modification expected	*Not clear from the project plan* Insufficient evidence in the project plan to determine	*Completely Prescribed* Expectation that materials and/or processes will be used without modification and implementation will be completely consistent	*Partially Prescribed* Expectation that materials and/or processes will be customized before/during implementation, but still follow set guidelines	*Partially Emergent* Expectation that the materials and processes will be substantially modified or developed and implementation will follow the set framework	*Completely Emergent* Expectation that individuals will be inspired to develop their own principles and design their own materials/implementation since no set framework is provided
F2. Degree of change to current practice – upstart time	*Not clear from the project plan* Insufficient evidence in the project plan to determine	*None* Individuals can easily integrate materials/procedures into their existing practice; no upstart time needed	*Some* Individuals need to make a few surface level adjustments to integrate materials/procedures into their existing practice; minimal upstart time needed	*Moderate* Individuals need to make many surface level or a few fundamental adjustments to integrate materials/procedures into their existing practice; moderate upstart time needed	*Considerable* Individuals need to make radical changes to integrate materials/procedures into their existing practice; significant upstart time needed
F3. Degree of cooperation required	*Not clear from the project plan* Insufficient evidence in the project plan to determine	*None* Requires no cooperation/interaction among individuals	*Some* Requires coordinated involvement of multiple individuals	*Moderate* Requires active involvement of multiple departments/units	*Considerable* Requires active involvement of multiple departments/units and institutional level engagement such as cooperation among different colleges
F4: Degree of formal approval/ policy change required	*Not clear from the project plan* Insufficient evidence in the project plan to determine	*None* Requires no formal approval or policy changes	*Some* Requires committee approval or minor policy changes	*Moderate* Requires formal approval or policy changes that may involve multiple levels	*Considerable* Requires substantial policy changes and approval at multiple levels

Factor	Unable to Rate	A	B	C	D
F5. Degree of resources required	*Not clear from the project plan* Insufficient evidence in the project plan to determine	*None* No additional resources required	*Some* Some additional resources (e.g., a few small pieces of new equipment, an undergraduate student assistant) may be required	*Moderate* Requires new resources, such as significant new equipment, restructuring of classroom facilities, a new dedicated space, or increased staffing needs	*Considerable* Requires substantial investment of new resources and recurring costs, such as additional faculty or staff

III. Aspects of institutionalization strategies that influence the likelihood of success (Evaluative)

In this section, a low score indicates that there is little evidence that the institutionalization plan is aligned with best practices and a high score indicates that there is clear evidence that the institutionalization plan is aligned with best practices.

Aspect	1	2	3	4	5
A1. Key players are identified (key decision makers and potential users)	*No*	*Yes – general* Description of key players is very general (faculty within a department)	*Yes – limited info* Key players are identified using some details (specific types of individuals – faculty, deans, etc.) but there is little or no description of why they were selected	*Yes - specific* Key players are identified with a brief description of why they were selected	*Yes–detailed* Key players are identified with a clear description of why they were selected and how they will contribute to institutionalization

Aspect	1	2	3	4	5
A2. Strategies engage key decision makers	*Not at all -* Information will be provided to key decision makers, but there are no plans to actively engage them in the initiative	*Very little -* The focus is on providing information to key decision makers and obtaining support, but there is little detail as to how these individuals will contribute to the initiative	*Some -* The focus is on obtaining support and cooperation from key decision makers through persuasion; there is limited ability for these individuals to shape the initiative	*Moderately -* The focus is on obtaining support and cooperation from key decision makers through engagement; there are opportunities for these individuals to shape the initiative.	*Significantly -* Key decision makers are actively involved in shaping the initiative from the very beginning
A3. Project begins to address issues of institutionalizati on from the very beginning of the project	*Not at all -* It is clear that institutionalizati on will not be addressed until the project is complete or nearly complete	*Very little -* Brief indication innovators are thinking about institutionalizati on	*Some -* Some discussion of how what key players may want/need to find the product useful will be determined	*Moderately -* Identification of barriers to institutionalizati on and how they will be addressed through design or data collection during development	*Significantly -* In addition to identifying what will be useful and how barriers will be overcome, there is a plan for formative feedback from key players during development
A4. Strategies consider the different aspects of the institutional system	*Not at all -* No discussion of institutional system elements and the type of changes required for institutionalizati on	*Very little -* Very few institutional system elements necessary for institutionalizati on have been identified; there is evidence that some drivers and barriers have been identified.	*Some -* Developer has identified one of the following institutional system elements that are likely to impact institutionalizati on: decision makers, local factors, interpersonal networks, department or institutional cultures	*Moderately -* Developer has identified some of the following institutional system elements likely to impact institutionalizati on: decision makers, local factors, interpersonal networks, department or institutional cultures	*Significantly -* Developer has identified the following institutional system elements likely to impact institutionalizati on: decision makers, local factors, interpersonal networks, department or institutional cultures

Aspect	1	2	3	4	5
A5. Level of thoroughness in institutionalization strategies	*Very low –* No approaches are identified (not clear what strategies will be used to seek institutionalization)	*Low –* Approaches are identified, but little detail is provided as to the rationale or how the efforts will be accomplished	*Moderate –* Approaches are identified with some indication of how they will be accomplished, or the rationale behind strategies can be inferred	*High –* Approaches are identified with sufficient detail and discussion of the rationale behind the choices; some information is provided for how the plan will be accomplished	*Very High –* Approaches are explicitly described, including a detailed rationale for strategies chosen, and how the plan will be accomplished
A6. Institutionalization strategies depend on the type of initiative	*Not at all -* There is no evidence that the match between strategies and the type of initiative or how best to reach key players has been considered.	*Very little -* There is little evidence that the match between institutionalization strategies and the type of initiative has been considered. The only strategy is to tell people about the initiative.	*Some -* There is some evidence that the match between institutionalization strategies and the type of initiative has been considered. There are some strategy elements beyond telling people about the initiative.	*Moderately -* There is evidence that the match between the initiative and either attributes of key players or the institutional system has been considered and institutionalization strategies are aligned with these	*Significantly -* There is evidence that the match between the initiative and attributes of both key players and the institutional system has been thoroughly considered and institutionalization strategies are clearly aligned with these
A7. Metrics to monitor progress towards institutionalization	*None* There are no metrics identified to monitor progress towards institutionalization	*Very little* There is some talk of metrics but it is unclear how they related to measuring the degree of institutionalization	*Some* There is at least one metric related to institutionalization but there is poor alignment to desired institutional change	*Moderately* There are multiple metrics related to institutionalization	*Significantly* There are multiple metrics related to institutionalization and they are clearly tied to their logic model of institutional change