Implementation of an I-Corps Inspired 3-Day Bootcamp for Graduate Students to Plan their Academic Careers

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Abstract

A Customer/Career Discovery Bootcamp was designed and delivered to graduate (PhD and masters) students at the University of Wisconsin, Milwaukee. It was then adapted and deployed at Michigan Technological University. The innovative 1½ - 3 day bootcamp consisted of three 3-4 hour sessions plus time to conduct discovery interviews for the graduate students. The Bootcamp content incorporates proven curricula from the Lean Launchpad program (i.e., NSF I-Corps) blended with Life Design curricula (Stanford Hasso Plattner School of Design) and several other innovative educational frameworks.

This novel approach to immersing graduate students in design and innovation activities as applied to individual career paths can enable student ownership of their career paths. Students depart with tools that have and will continue to expand their career network, test innovative research ideas, and improve opportunity identification, confidence, and leadership skills. These tools enable them to seek out opportunities to use their STEM degree knowledge to positively impact the world. Participant feedback suggests this type of professional development training is highly needed and valued by our graduate students.

Background of Graduate Student Professional Development

It is often said that engineering educators are preparing graduate students for careers and jobs that don't yet exist. As technology and global grand challenges accelerate, this is more true now than ever before. In 1998, GRE® Research assessed career progression from science and engineering graduates [1] and found a large loss of talent of practicing engineers from engineering fields (40% planned to leave) due to lack of satisfaction and feelings of disconnect in making a contribution to society. In 2014, roughly 80% of graduate students pursued and earned a position in industry after graduation [2]. However, it has been noted that there is a misalignment between the preparation provided in graduate study and the expectations of graduates once in industry [2]. More recently, in 2020, Choe and Borrego studied graduate student engineering identities and research identities alongside their career interests and recognition of options [3]. Results revealed that students considered multiple options with a majority more interested in industry/government than academia. Recommendations underscored the importance of mentoring and preparing graduate students for a broad range of options in academia, industry, and government. Thus, recent efforts have focused on faculty education to broaden their attitudes toward non-academic research careers and support doctoral students exploring career options with broad societal impacts [4]. For example, NIH Broadening Experiences in Scientific Training (BEST) programs have shown significant advancements in faculty support of career development training in biomedical science fields [5].

While professional development activities [6-8] emphasize versatile preparation, there is less emphasis on efforts that place students at the center of exploring, discovering, and creating their own career opportunities. Graduate student agency was studied by O'Meara et al., identifying the

impacts on students' motivation, successful completion, and ultimately their career placement. Messaging at the department level plays a pivotal role in graduate student agency [9]. Individual Development Plans (IDPs) are heralded as tools to encourage graduate student agency and communication with their faculty advisors [10, 11], but are often employed without first providing education and context on options. Furthermore, training often treats students and organizations as having static characteristics for which organizational fit must be determined [12], while students are often seeking ongoing growth opportunities that sequentially build to desired societal impacts.

To address this gap, the discovery activities in the Customer/Career Discovery Bootcamp are a form of meaningful learning, defined by Koh 2017 [13] based upon Ausubel [14] to "involve the active participation of students in experiences that are cognitively engaging." Further, reusable learning objects (RLO), typically considered a digital resource, are accessible, reusable, and adaptable learning tools that can be utilized to advance learning and professional development [13]. Additional work has shown that learning effectiveness is related to the integration of RLOs into learning activities [15]. Prior RLO efforts have made use of games [16] and student-produced artifacts [17]. RLOs tend to be reusable for the instructors who oversee updates [16] or static, non-living products produced by the student, such as portfolios [18]. This Customer/Career Discovery Bootcamp aims to provide RLOs in the form of a mindset and toolkit approach for students to adopt that can guide and inform current and ongoing career choices.

Defining short-term and longer-term career goals relies upon self-reflection, which has traditionally been a solitary activity. However, Warman found that veterinary graduates had better outcomes when they were able to talk with colleagues and share reflective activities [19]. It was determined that these reflections were particularly useful as students transitioned to the working life stage of their careers [19]. One reflection approach enabled pharmacy students to focus on personal development, professional development, and professional identity formation [20].

Additional efforts assessed student perception. In one study, MBA students were asked about their perceptions of their preparation and readiness for business careers after working on and completing a project with a real-world industry client[21]. Information Technology students were asked about their career confidence and its relationship to their short and long-term career goals [22]; this work further identified gaps in student understanding of actual career opportunities and options. Within the Civil Engineering field, Simmons's group assessed whether students were aware of and understood the necessary capabilities for employability and sustained career development using "five key elements: professional skills, experience, career development learning, emotional intelligence, and
degree-specific knowledge" [23]. The findings revealed that students rely upon extracurricular activities and experiences inside and outside the classroom when preparing for careers and demonstrate the unmet need for students to have experiences while in school exploring options as well as a scalable toolkit for ongoing career explorations.

From these contexts, the Customer/Career Discovery Bootcamp described herein builds upon this ever-evolving knowledge of professional development for graduate students by enabling graduate student agency. The bootcamp provided tools for graduate students to gain perspectives in their field to better understand their own interests and career goals, to add depth and maturity to IDPs, and to enhance meaningful conversations with their research advisors.

Motivation

One of Dr. Gutzman's graduate research assistants, an Entrepreneurial Lead in a local UWM NSF I-Corps program, showed noticeable personal transformation upon program completion. His newly gained confidence in talking to strangers, exploring new ideas, and sharing unfinished work sparked the idea of catalyzing this kind of change in other graduate students. At that time, Dr. Gutzman was leading a campus wide strategic planning exercise around the future of research at UWM. Seeing the need for student empowerment and seeing the personal outcomes of the program focused on research commercialization (I-Corps) gave her the idea to develop a new program that would address the problem. Drs. Raber and Avdeev, long-term collaborators through the Great Lakes I-Corps Hub and the d.school's University Innovation Fellows had similar observations with students in their programs at two different campuses, as well as across the two somewhat overlapping academic networks. The bootcamp idea was born. A question of student motivation was at the top of our minds at the conception stage. We experimented with incentives and marketing strategies converging to these three ingredients: (1) stipends - graduate students would receive a modest stipend for their participation, (2) timing - the bootcamp should take place during winter or summer break and not overlap with academic semesters; and (3) word of mouth marketing - the experience should be on such a high level that student participants would enthusiastically market it to other students (proven to work).

Bootcamp Structure and Content

The structure and content of the Bootcamp borrows from the I-Corps Lean Start-up methodology as well as the Life Design framework and interactive approaches learned at the Stanford d.school's Teaching & Learning Studio. The stated learning objectives of the bootcamp are:

- Ability to formulate and test non-scientific hypotheses
- Ability to identify the broader impact of your research work
- Ability to apply these methods to grant writing, job search, and career development
- Develop an understanding of the NSF I-Corps program principles

Additional objectives include networking skills development, personal reflection and action planning, and community building. The bootcamp is typically delivered in 3 half-day sessions over a 3-day period, although a 2-day version has also been piloted. The advantage of holding the bootcamp over 3-days is that it provides additional time for networking and interviewing.

A variety of approaches are used to recruit participants, including email, public announcements, faculty/chair recommendations, and word-of-mouth. Interested participants submit an application for the workshop, and the workshop usually fills quickly with a long wait list of over-capacity applicants who then have the first opportunity to attend the next offering of the bootcamp. Participants who fully participate in the workshop are eligible for a modest stipend, typically $300.

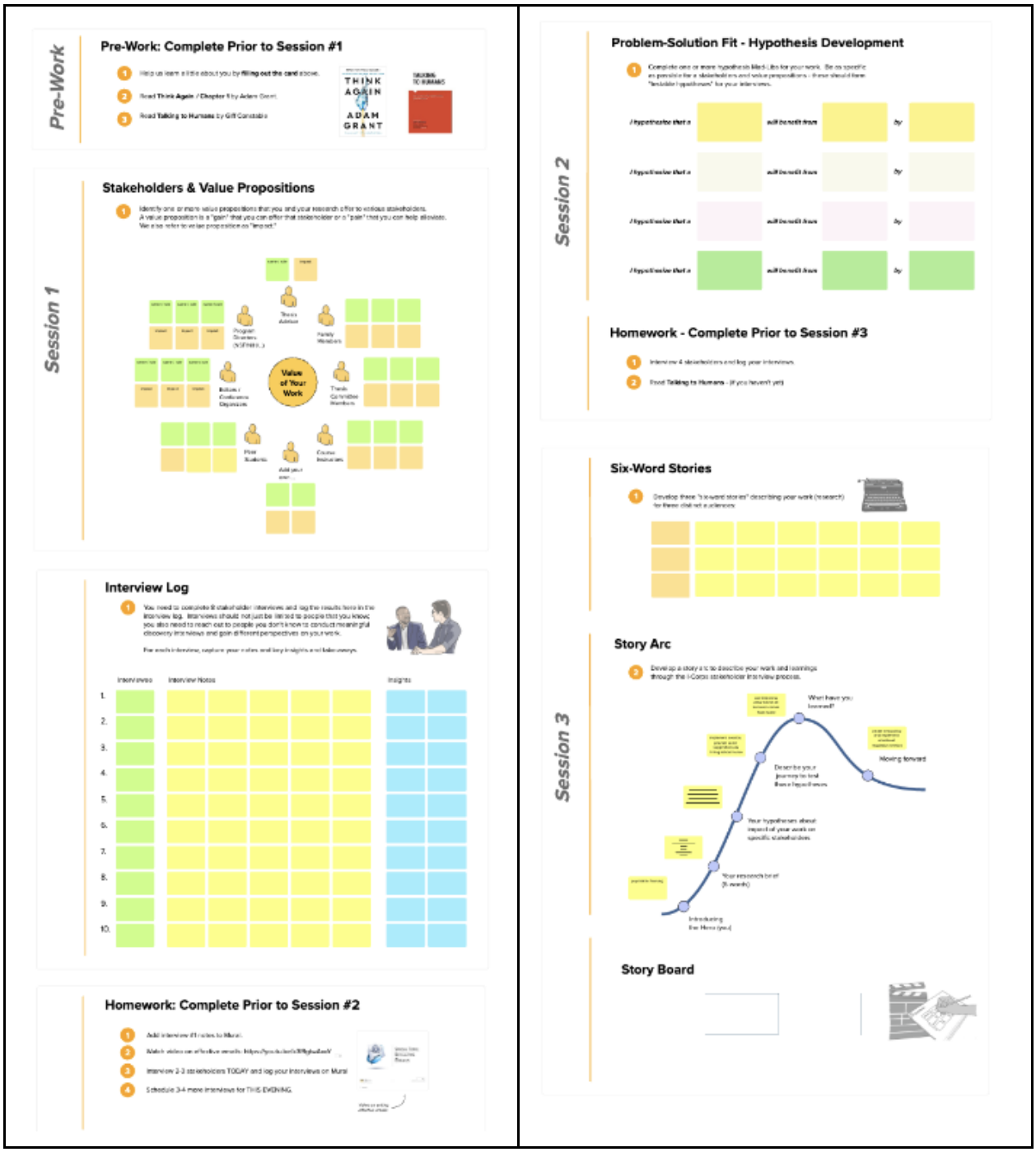
While participants are primarily from STEM-related disciplines, several participants have come from liberal arts disciplines such as film, theater and humanities. The variety of disciplines fosters engaging discussion and sharing of ideas and perspectives throughout the highly interactive workshop. When demand exceeds capacity, priority is given to students who are closer to graduating, allowing them the opportunity to explore various career paths prior to starting their own careers. Cohorts of about 20 students seem to be optimal, although cohort sizes of 30-40 have also been successful provided there is an adequate number of facilitators (typically one facilitator per 6-8 students).

The program is highly interactive, and the platform Mural is used to capture participant work as they progress through the various activities. A typical flow of content is shown in Table 1, with each session building upon the previous one to help students explore opportunities for their research and career interests, develop their "story", and build skills and mindsets they can apply throughout their careers. An example Mural template used in the workshop is shown in Figure 1.

Table 1. Bootcamp Content

Day/Session 1	**Day/Session 2**	**Day/Session 3**
■ Welcome/Stoke Activity ■ Norms/culture for the bootcamp ■ Research Pitch ■ Identifying Stakeholders & Value Props for your research ■ Intro to Customer Discovery Interviewing ■ Interview Practice	■ Debrief Interviews ■ Idea to Impact ■ Career Exploration - alternative paths for PhDs ■ Problem-Solution Fit ■ Tips/Best-Practices for Interviewing	■ Debrief Interviews ■ Good/Bad Questions ■ Storytelling ■ Creating six-word Stories ■ Micro Learning ● Think Again ● Job Interviewing ● I-Corps Program ■ Action Planning
Conducting Interviews * Reflection * Networking		

Figure 1. Sample Mural Template



The use of the Mural platform allows for an at-a-glance view of participant progress and provides a useful artifact for their use post-workshop. A “community board” Mural is also created to share participant info and workshop resources. For those who don’t have access to, or experience with, Mural, individual Google slide decks for each participant work well as an alternative.

Other resources made available to participants and/or referenced in the workshop include:

- Talking to Humans - this text focuses on how to structure and run effective "customer" interviews and turn learnings into action. This text is available to download for free. [24]
- The Mom Test by Rob Fitzpatrick - this text discusses topics such as "how to avoid biased feedback" and 'how to connect with people in a way that makes them want to talk to you,' which is helpful as participants begin to network, and assess what they have learned through interviews. [25]
- Think Again by Adam Grant - participants are asked to read the first chapter as pre-work to the Bootcamp. Debrief of this resource is discussed during the third session, where topics such as "embracing the joy of being wrong," "learning something new from each person you meet," and "asking better questions" are emphasized. [26]

By the conclusion of the bootcamp, participants leave with an understanding of, and practice with, key skills and mindsets they can apply to their research activity, career planning, and networking.

Assessment

To date, a total of eight bootcamps have been offered: seven at UW-Milwaukee and one at Michigan Tech. A 2025 bootcamp is being offered at each location again in January (UWM) and February (MTU). Feedback is collected from participants through a post-workshop survey that seeks input on the perceived value of the workshop, key learnings, and suggestions for future improvements to the workshop. Participants are also asked how likely they are to recommend the workshop to their colleagues.

To date, 226 graduate students have participated in the bootcamp. The response rate to the survey has been 100%, likely due to the fact that receipt of the stipend is contingent upon completing the survey. 100% of participants also indicated being likely to recommend the bootcamp to their colleagues/peers and found the resources used in the bootcamp to be of value.

In addition to the above data, which reflects a positive reaction to the Bootcamp experience, participants were also asked to reflect by responding to the following two open-ended prompts:

- Complete the following - " I used to think _____ about career planning/life design/interviewing, now I think _____"
- Share something they "liked" about the bootcamp, something they "wish" were different about the workshop, and an idea/suggestion they have to improve the bootcamp for future participants using the "I liked, I wish, What if" feedback framework.

A Word Cloud representing responses to the prompt "I used to think, now I think" is shown in Figure 2. Survey responses to the question of "I used to think, now I think" were clustered into key theme areas, which reflected shifts in perspectives around communications, networking, research impact, soft skills, and success and career paths. Representative quotes reflective of these shifts include:

"I used to think about how to solve technical problems related to my project. Now, I think more broadly about the impact and applications of my research, who will be impacted by my research, who is interested in my work, and how I can connect with them."

"I used to think effective communication was mostly about talking, but now I realize it's equally important to actively listen and understand others' perspectives."

"I HAVE ALWAYS HAD A NARROW IDEA WHERE I WILL FIT AFTER MY STUDIES BUT NOW I FEEL LIMITLESS AND I AM WILLING TO EXPLORE MY POTENTIAL ON DIFFERENT LEVELS."

"I used to think that scientific research is just your own space and your own ideas, and now I think talking to other people, finding more about them will actually help your research."

"I used to think that people would be bothered if I asked them about their career decisions, because I imagined people were too busy to give me advice. Now I think that people actually find it quite rewarding to reflect on their path in life, and are happy to talk with me about my goals and offer guidance."

"I used to think that interviewing people about my highly specialized research may not be really helpful, but I definitely changed my mind as I learned that every single person I interviewed had something to contribute or at least pointed me at a direction to explore."

Figure 2. Response Word Cloud for "I used to think and now I think"

Similar clustering was developed for the responses to "I liked, I Wish, What if" and reflects a broadening of perspectives, personal growth, and value in the networking opportunities among the participants. Participants further indicated they appreciated the structure and organization of the program, being "pushed" outside their comfort zone, and the supportive environment. Ideas

for future improvement reflected a desire for continued opportunities to learn and network as well as guidance on constructing/revising a resume for industry, interview preparation, constructing elevator pitches and grant writing. These responses suggest that additional professional development training would be a welcome addition to the graduate student experience and have provided the facilitator team with many useful ideas for continuous improvement.

Discussion

The intent of the Customer/Career Discovery Bootcamp was to provide a versatile discovery toolkit that offers graduate students the tools and agency to explore and learn about career options. The bootcamp content bridges life design curricula inspired by Stanford's Life Design Lab [27] and customer discovery tools inspired by NSF Innovation Corps (I-Corps) [28]. The life design curricula are full of active learning experiences to inspire creativity to tackle "wicked problems of life and vocational wayfinding." The I-Corps curricula democratizes commercialization approaches by enabling faculty to learn and teach the process and offer participants a value-added look at the process of discovery interviews as applied to career wayfinding.

The Customer/Career Discovery Bootcamp is a unique hybridization of life design and discovery tools. This combination provides customizable and buildable professional development for graduate students. Stipends were provided and played a role in getting students to attend, but once in the bootcamp, students become immersed in the content and tools they are learning to help themselves guide and inform current and ongoing career choices. They leave with reusable learning objects (RLOs) that will serve them throughout their career in seeking out information and opportunities to identify and create rewarding careers.

The assessments revealed that students are hungry for this type of professional development, which includes guidance on networking and initiating conversations. They appreciate the opportunity to explore career path options beyond the traditional roles in higher education.

Limitations of this work include the lack of long-term post bootcamp assessment to determine whether the mindset shift persists in graduate student thinking and attitudes about their careers. The authors have plans to address this limitation through a structured IRB-approved study for future offerings of this workshop.

Conclusions and Future Recommendations

The Customer/Career Discovery Bootcamp has proven to be an innovative and transformative professional development program for graduate students at UWM and MTU. By creatively integrating and building on methodologies from the NSF I-Corps Lean Launchpad program(s) and Stanford's Life Design curricula, the bootcamp equips participants with tools and strategies to actively design and navigate their career paths. This initiative places students at the center of their career exploration, fostering a sense of ownership, confidence, and adaptability that is often missing from traditional graduate training.

Participants consistently reported significant shifts in perspective. They emphasized newfound awareness of the broader impact of their research, the value of collaborative engagement, and the importance of exploratory learning in both academic and non-academic settings. The bootcamp

also enabled the development of critical transferable skills, such as networking, communication, and opportunity identification, which are essential for success across a wide range of careers.

The program's flexible structure, supported by digital tools like Mural and reusable learning objects, underscores its adaptability for deployment across institutions and disciplines. This versatility ensures that the bootcamp can serve a broad audience while maintaining its core objective of fostering student agency in career exploration.

Building on the successes of the Customer/Career Discovery Bootcamp, there are several avenues for refinement and expansion. To increase the program's reach, efforts should focus on adapting it for broader implementation across institutions and disciplines. Collaboration with funding agencies and industry partners can support this scaling process, ensuring a wider impact.

Participants expressed a desire for ongoing professional development opportunities, suggesting the value of follow-up workshops focused on advanced topics such as resume building, elevator pitches, grant writing, and interview preparation. Establishing alumni networks or advanced sessions could further support participants' career development and reinforce the skills and mindsets introduced during the bootcamp.

To enhance accessibility and inclusivity, the program could be tailored to accommodate all student populations, including those from a wide variety of first-generation backgrounds. Offering virtual or hybrid delivery formats would also enable participation from students with varying schedules and geographic locations.

Long-term assessments of the bootcamp's impact on participants' career trajectories would provide valuable insights into its sustained benefits and inform further improvements. Additionally, engaging faculty and advisors in workshops aligned with the bootcamp's objectives could foster a more supportive ecosystem for students, ensuring that Individual Development Plans (IDPs) and mentorship conversations are enriched by the program's principles.

Finally, leveraging the enthusiasm of past participants through peer marketing and showcasing alumni success stories have the potential to strengthen recruitment efforts. This approach would capitalize on the program's strong reputation and encourage wider participation.

The Customer/Career Discovery Bootcamp is proving to be a model for modern graduate education, addressing the evolving professional needs of students. By continuing to refine and expand the program, it has the potential to make an even greater impact, empowering students to navigate their career journeys *and* make meaningful contributions to society.

Spring 2024: Student cohort and teaching team (UWM)

Spring 2024: Student Cohort (MTU)

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