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Designing Futures: ECE Graduate Students' Experience with a Professional Development and Career Planning Module

Prof. Pamela Bhatti, Georgia Institute of Technology

Pamela Bhatti is a Professor in the School of Electrical and Computer Engineering at the Georgia Institute of Technology. Bhatti received her B.S. in bioengineering from the University of California, Berkeley, in 1989 and her Ph.D. in electrica

Dr. Jacqueline Rohde, Georgia Institute of Technology

Jacqueline (Jacki) Rohde is the Assessment Coordinator in the School of Electrical and Computer Engineering at the Georgia Institute of Technology. Her interests are in sociocultural norms in engineering and the professional development of engineering students.

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Electrical and computer engineering (ECE) degree programs aim to prepare their students to succeed in their future professional endeavors. Not only must these programs help equip students with disciplinary skills and knowledge, but they must also help students develop the mental habits that will enable them to find career success. Given the breadth of career opportunities in ECE, there is an opportunity to integrate professional development topics into the ECE curriculum. We present the results of a one-week module for graduate students that links disciplinary and intrapersonal knowledge through a design thinking framework. We present a content analysis and descriptive statistics from two surveys distributed to students from Fall 2024 about their experiences with the module. These surveys asked students about their experiences with the module, their engineering identity and belongingness, and their beliefs about their future careers. A major takeaway from this analysis was the saliency students experienced around the topics of ambiguity, failure, and risk in the context of thinking about their future careers. Finally, we offer recommendations for other ECE educators interested in integrating career planning into their curriculum.

Introduction

This full paper explores how electrical and computer engineering (ECE) master's students responded to a professional development module embedded within a high-enrollment ECE course at a large, public, research-intensive institution in the Southeastern United States. The field of ECE is broad, offering diverse career opportunities to students [1]. Supporting students in navigating these career opportunities requires addressing two key areas. First, students must develop an understanding of their discipline, including the nature of work associated with various roles. This knowledge is typically conveyed through technical coursework and internship experiences, although opportunities remain to strengthen students' awareness about various engineering roles [2]. Second, students must cultivate self-awareness of their interests, preferences, values, and abilities to make informed decisions about their career paths. Together, disciplinary knowledge and self-knowledge enable students to make thoughtful, meaningful, and confident decisions about their futures. While significant research has explored how engineering students approach career decision-making, much of it has focused on undergraduates, leaving a gap in understanding at the graduate level [3].

Master's students offer unique insights into the professional development of ECE students because their advanced training can unlock additional career prospects in academic, industry, and entrepreneurial domains. However, some students may find it challenging to navigate many career possibilities, especially those with a low tolerance for ambiguity [4]. This trait, which has been linked to STEM disciplines, suggests that such students may require additional resources to build confidence in their career paths. Design skills have been identified as a critical mechanism through which engineering students can learn to navigate and thrive in ambiguous environments [5], positioning design as a promising tool for fostering career development.

The professional development module described in this study aims to equip students with the skills and mental frameworks necessary for professional success by applying design thinking. The term 'design thinking' is rooted in human-centered design and is often related to developing

a product or service. However, design thinking also evokes a sense of creativity and intentionality that goes beyond industrial or commercial settings. IDEO, a pioneering company in design thinking, dramatically expanded the term's dissemination and implementation. "We want to teach people how to use design thinking in their lives, communities, businesses and organizations," asserts Tim Brown, Executive Chair of IDEO [6]. Building on this vision, we designed a course module for graduate engineering students to integrate design thinking into self-reflection and career development practices. Using a framework developed by Bill Burnett and Dave Evans at the Stanford Design School, we created a series of preparatory and in-class activities to guide students through career reflection exercises, encouraging them to explore their individual career values and goals.

Our overall objective is to build personalized and lifelong career development capacity within a predominately technically driven master's program within a high-enrollment ECE course at a large, public, research-intensive institution in the Southeastern United States. Embedded in a semester-long course addressing innovation and entrepreneurship, this module has engaged over 600 students in a career reflection exercise. The program's diverse student body brings a wide range of expectations about what it means to innovate, design, communicate, and plan for the future. This diversity creates a unique opportunity to inspire students to reimagine their career trajectories and to apply their engineering design skills in novel and meaningful ways.

This study investigates the research question: ***How do ECE graduate students describe their experiences completing a professional development module?*** To answer this question, we first describe the components and pacing of the module. We then investigate post-module survey data to understand the impacts of professional development education on ECE master's students. Our findings highlight how design thinking can enhance students' self-awareness, expand their exploration of career options, and build their confidence in planning for the future. This paper aims to provide practical insights for educators seeking to integrate professional development into their curricula.

Background

Using principles from IDEO's design thinking methodology and the book "Designing Your Life: How to Build a Well-Lived, Joyful Life" (DYL), the one-week module was integrated into a semester-long, required innovation and entrepreneurship course. This section describes the module development, course context, and before-class and in-class activities. The remaining sections of the paper address the analysis of post-module survey data.

Module Development

To prepare for the career reflection exercise, the lead author of this article read the Design Your Life (DYL) book [7] and completed the activities outlined in the text. A wealth of resources and testimonials on the Stanford website were also examined [8]. Seeking to tailor the work to a graduate student population, the lead author also met virtually with Dr. Laura Schram, Director of Professional Development & Engagement in the Rackham Graduate School at the University of Michigan (UM), who developed a 6-session optional, non-credit bearing course for doctoral students and postdoctoral scholars in any discipline at the UM [9]. Dr. Schram was instrumental in selecting exercises from the DYL book, leading to pre-work and in-class activities for a 90-minute studio offering.

Following a peer-to-peer approach, new instructors observed a more experienced instructor for two studios. New instructors may also engage in micro-teaching, where they teach one of the phases outlined below. Notably, authentic experiences shared by each instructor serve to engage the students more closely. These suggestions can readily support scaling and greater deployment.

Course Context

The module is embedded in a graduate-level course in the School of ECE that addresses the principles of entrepreneurship, intrapreneurship, teaming, ideation, and leadership. Course enrollment averages around 140 students per semester. This course is required for the MSECE degree, and the majority (though not all) of the students in the course are master's students in ECE. Over the semester, students work in teams of four to six to analyze customer needs and viability for an envisioned technological product or service of their choosing. In the context of this project, students are introduced to IDEO's five phases of design thinking: empathize (gather inspiration), define (generate ideas), ideate (make ideas tangible), prototype, and test (testing to learn).

A few weeks before the career development module, students engage in a hands-on exercise during class to internalize the different design thinking phases. Student pairs are tasked with designing and constructing, or sketching, a wallet for their partner within the 90-minute class period [10]. A plethora of resources and guides exist online for facilitating this exercise (often called "The Wallet Project"), which can be completed in a host of settings, languages, and modalities (e.g., sketches vs. a physical product). Participants were guided to segment their inquiry in terms of the design thinking phases, and they shared the story of the wallet's creation during a debrief session at the end of the studio time.

Both The Wallet Project and the overarching customer discovery project in the course help students learn how to define solutions and generate quick prototypes. This skill set may not be exercised in traditional engineering coursework that focuses on finding singular, correct answers. To quote IDEO, "A human-centered designer knows that as long as you stay focused on the people you're designing for—and listen to them directly—you can arrive at optimal solutions that meet their needs." Intentionally, The Wallet Project introduces students to flexibility in thinking and focus on a "customer," which starkly contrasts with, but augments, the rigorous didactic training they receive in ECE disciplines. The value of pivoting an idea and the need to center the end-user create the foundation from which students engage in design-based career exploration two to three weeks later in the course.

Module Pre-Work

Table 1 describes the lesson plan for the module and provides further details about the module components for the pre-work and in-class exercises. Before class, students complete two pre-work exercises: a Values Inventory worksheet and a Workview writing exercise. This work is assigned individually. To preserve the confidential nature of one's career aspirations and promote authentic exploration, the students were not required to submit the assignment but acknowledge its completion.

In the Values Inventory, students are given a list of 25 possible values they might have for their future career, such as influence, leadership, pace, mission, and travel. They are asked to select ten values and then narrow them down to 3-5 core values.

Table 1. Lesson Plan for Career Development Module[1]

Pre-work + Studio Topic One: Making Meaning Objectives: 1) Generate a set of personal values for class discussion and 2) explore and create a Workview and 3) discuss and possibly refine values and how one's work is integrated into a life plan. Expected Student Effort: 45 minutes ahead of the studio, 30 minutes in the studio. Assessment: Work checked for completion but not assessed given the personal nature. During the studio, the instructor will monitor to see if each student appears engaged in small group discussions and encourage in-class discussion.	
Thinking Skills	What Students Will Do
Analyzing	A digital copy of a values inventory will be uploaded to a (learning management system, LMS). The following instructions are provided: Each box below contains something that you might care about in your work environment. Step 1: Read each carefully and check the boxes for all the elements you would like to have in your career. Step 2: Try to down select to five elements. Consider how you are making these element selections. What are you prioritizing, or dismissing as less important?
Creating, synthesizing, and evaluating	A digital copy of a writing exercise entitled inventory will be uploaded to a (learning management system, LMS). The following guidance is provided. Write your individual, personal Workview which should be approximately 150 words. Be prepared to discuss aspects of your Workview during the studio with a partner. A Workview addresses the critical issues related to what work is and what it means to you. It is not just a list of what you want from or out of work, but a general statement of your view of work. It is a compass that will help you determine what direction you want to take with your career.
Remembering	A fill in the blank slide is presented with the first letter of each of the five phases of design thinking. Students are instructed to see if they can recall each phase. The following slide reveals the phases and set the roadmap for the studio's content.
Creating, synthesizing, and evaluating	As the students are discussing in small groups, the following prompts are provided via a projected slide: Consider your Workview writings and your values inventory selections and discuss the following topics in any order: • What surprised you? • What did you reinforce? • What do you need to learn more about? • Anything else you found insightful? • Discuss your top few values and consider how they relate to, reinforce, or contradict, your Workview. • Why or why not would you do these activities again the 3-5 years?
Reflecting	The instructor guides students through discussing their findings and encourages them to think about how the first two phases of design thinking were implemented (Empathize and Define).

[1] Lesson plan inspired by Chapter 10, Creating Plans for Learning in Where Great Teaching Begins: Planning for Student Thinking and Learning [11]

Studio Topic Two: Career Odyssey Planning
Objective: Try out a Career Odyssey Exercise.

Expected Student Effort: 10 minutes in the studio.

Assessment: During the studio the instructor will monitor to see if each student appears engaged in crafting their individual Career Odyssey and encourage in-class discussion.

Thinking Skills	What Students Will Do
Creating and synthesizing	A paper copy of the Odyssey Plans Template, the Career Odyssey is shared with each student. A digital copy is uploaded to the LMS. The students are given a background of what comprises a Career Odyssey. Each "Life" of the Career Odyssey is described along with an example of each Life from the instructor's career path and envisioned future. Each element of the Odyssey Plans Template is then discussed. Students are instructed to select one of the Life options and write down a timeline and answer questions as part of the exercise. The instructor underscores the importance of the process and encourages students to think broadly.
Reflecting and evaluating	The instructor congratulates the students on completing their respective on a life design and their effort at completing the Ideate phase. The instructor bridges students to the Prototype and Test phases by asking the following questions for reflection and discussion. • Where did your plan lead you? • You have a plan, but do you need to do some discovery? • How is discovery related to informational interviewing? • How can you do background work about a Life?

Studio Topic Three: Prototyping and Testing +
Homework Reading Assignment
Objective: 1) Formulate individual definitions of success and failure, 2) introduce failure as a vehicle for leaning, 3) address risk and failure, and 4) introduce the concept and mechanics of building a Failure Portfolio as outlined in the homework reading assignment.

Expected Student Effort: 10 minutes in the studio and 30 minutes as homework reading.

Assessment: During the studio the instructor is in a delivery mode and introduces and contextualizes the reading assignment. An online quiz is administered at the end of the week covering concepts from the reading assignment. Completion of the reading is expected and assessed via the quiz.

Thinking Skills	What Students Will Do
Analyzing	Students are directed to download a copy of the article: "Designing your failure portfolio: Capacity building for lifelong learning" Each student is directed to read the article and to think of failure as a growth opportunity. The article guides students on taking moderate risks to learn and the class context is to think of informational interviewing as a low risk to learn about a job or profession.
Assessment	An online quiz poses the following questions for each student to be answered independently. 1. In the assigned IEEE Potentials article entitled: Designing your failure portfolio: Capacity building for lifelong learning, a curve is depicted in Figure 1. Discuss why the curve is shaped as an inverted U in the context of learning and failures. 2. State three new learnings and/or validations of your beliefs related to your career plans from the studio this week (3 items total).

In the Workview exercise, students are asked to write an approximately 150-word statement that integrates their work and life. They are offered prompts such as, “Why do you work?” and “What energizes you at work?” and encouraged to think of their long-term career outlook. Because questions of this nature can become all-consuming, students are advised to limit their responses to within 30 minutes.

Together, these two exercises engage with the “Empathize” and “Define” stages of design thinking. S*tudents are now their own customers and their charge is to design for themselves a career that aligns with their personal values*. Students are asked to bring their Values inventory worksheet and Workview exercise to the following studio session.

Module In-Class Activity - Introduction
The in-class portion of the module begins with a group conversation in which the facilitator outlines ground rules and expectations to foster open discussion while respecting student privacy. To promote discussion but allow for individualized comfort of sharing thoughts during discussions, the instructor clearly states that students are not required to voice any sensitive or personal information, and they are not graded or recorded. The discussion also includes a slide that projects and defines “Chatham House Rules” (i.e., participants are free to use the information shared but preserve the identity of their colleagues) as a tool to discuss the extent to which the facilitator expects students to honor one another’s privacy. Recognizing how idioms can be a source of alienation for students from backgrounds outside the United States, we have found it beneficial to devote the beginning of studio time to a deeper discussion about similar phrases or expectations for privacy based in other settings or cultures.

Module In-Class Activity – Career Odyssey
As a warm-up to the module, students are organized into groups of four to six and asked to reflect on the pre-work exercises and the interplay between their Workview and Values Inventory. After this debrief, students work individually to complete a Career Odyssey worksheet. This worksheet is adapted from DYL and encompasses the “Ideate” phase of design thinking.

The Career Odyssey worksheet entails selecting a particular career pathway and determining what that pathway might look like. The career could be what they currently envision, a career if the present career was no longer an option or a wildcard/encore career. For our population, about 10% of the master’s students are either already employed or have committed to a job. Thus, planning for another career category, e.g., encore career, maintains their involvement in the studio while not disturbing the career pathway they embark on.

Given the class's time constraints, students select one pathway spanning and scope it to a three-to-five-year time horizon. Students are asked to develop milestones, consider resources, and gauge their enthusiasm for the chosen pathway. For example, the lead author shares their Career Odyssey completed when piloting content for the studio. A tutorial delivered by Bill Burnett may be accessed for further detail [12]. The fast-paced exercise is followed by a substantial debrief after the segment and a break before the second segment.

Module In-Class Activity – Informational Interviews
In the second segment, which takes up the last third of the studio, students tackle the "Prototype" and "Testing" phases of design thinking. The instructor introduces informational interviewing as a low-stakes way to build an understanding of a potential career pathway or role within an organization. In other words, these interviews allow students to imagine themselves in a particular role and engage in career "prototyping." As a group, the students generate potential pros and cons of informational interviewing (e.g., accuracy of information, access to representative employees, etc.). Then, individually, students identify a role they envision and build out a list of questions they would ask during an informational interview. As a concrete exercise, students are given a worksheet to populate related to the role they are curious about. Three columns are provided where the student can identify "what I already know" about the role, "what I want to know" about the role, and a column to be completed after an interview entitled "what I learned." Boxes are also provided to capture an "anticipated risk" in conducting the interview, which is completed before the interview. A box entitled "experienced risk" will be completed after the interview. Depending upon the time available, students may begin the worksheet in class or immediately jump into interviews. Given just 5 minutes each, they pair up and conduct mock informational interviews. While it is understood that most would need more time to thoughtfully select and pare down a list of questions about a role or job, this exercise is meant to reinforce and expand the customer discovery skills they are concurrently developing in entrepreneurship. Plus, by forcing action, students may build confidence; even on the spot, they can think and ask questions.

Module In-Class Activity – Risk and Failure Discussion
The studio culminates with a candid discussion of failure and associated risks. A common mindset in design thinking embraces the value of failure, and failure can be a starting point for learning growth [13]. At the same time, failure and risk carry significant consequences in the context of students' future employment and financial stability. The instructor considers sensitivity to failure mindfully and respectfully and does not brazenly articulate that students should embrace failure. Rather, the assertion is that students can thoughtfully consider risk and learning tradeoffs. Students discuss together in the studio to define failure in their own words. Previous discussions have highlighted the potential for catastrophic career failures but also the potential for more minor issues (e.g., not speaking up for oneself) to accumulate until a breaking point. Growth and risk are intimately linked with career development, and design thinking allows students to think more deeply about themselves and their ambitions.

Methods
This study used a post-completion survey to examine students' perceptions of a career development module. The survey was designed to assess four key areas: (1) Career Confidence before and after the module, (2) perceived benefits of the five module components, (3) Engineering Identity and Belongingness, and (4) Career Development Beliefs. The university's Institutional Review Board (IRB) approved the study. The findings will provide valuable insights for educators aiming to help students make confident, informed career decisions amidst the wide array of opportunities available in ECE careers.

There were 142 students who participated in the module in the Fall of 2024 and 147 in the Spring of 2025. Demographic information about these students was not explicitly collected. Still, the

required nature of the course means that the overall program demographics can provide an approximate representative sense of the course profile. This cohort of master's program had 476 students, of which 381 (80.0%) were male. There were 279 (58.6%) international students. Thirty-one students (6.5%) were designated by the university as belonging to an underrepresented minority by race or ethnicity (while small, this designation is only applied to U.S. citizens, meaning that the proper proportion is 15.7%). All students were in non-thesis degree pathways.

The first data source is a post-module reflection assignment, an open-ended written assignment asking students to "State three new learnings and/or validations of your beliefs related to your career plans from the studio this week (3 items total)." The authors conducted a content analysis [14] on these open-ended responses to identify the module's most salient components from the Fall 2024 and Spring 2025 groups. The content analysis involved multiple readings of the responses and developing emergent categories to characterize common responses.

The second data source is a survey distributed in Spring 2025 to participants to identify the module's long-term effects and characterize students' current career beliefs. Career Confidence was measured using a retrospective pre-post design, where students rated their confidence on a 10-point scale (1 = low confidence, 10 = high confidence) both before and after completing the module in the same survey. While retrospective self-reporting differs from a traditional pre-post measurement, this approach reduces issues related to differences in question interpretation and facilitates matched data analysis. Essentially, this item tells us how students after the module saw themselves before the module. All interpretations of confidence changes should be contextualized within the limitations of self-reported retrospective measures.
Perceived benefits of the module components were assessed by asking students to rate how each of the five activities contributed to their career development. These components included:

1. **Pre-work:** Workview Writing Exercise
2. **Pre-work:** Values Inventory Worksheet
3. **In-Class Activity:** Career Odyssey Exercise
4. **In-Class Activity:** Informational Interview Discussion
5. **In-Class Activity:** Risk and Failure in Careers Discussion

Students rated the benefits of each component on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

To measure Engineering Identity and Belongingness, we adapted validated items from existing scales [15,16]. These items assessed students' relationship with engineering beyond its career-related aspects.

Career Development Beliefs were evaluated using 11 items developed by the authors. These items were aligned with the module objectives and rated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Example items include:

- *I am unsure about what I want to achieve in my career.*
- *I have a vision of what my career trajectory might look like over the next 5–10 years.*

Survey Administration
The survey was distributed electronically via the course Learning Management System (LMS) approximately one week after students completed the career development module. Participation was voluntary, and responses were not linked to students' grades. The survey remained open for one week. This study was approved by the institution's Institutional Review Board (IRB).

Participants
A total of 27 valid responses were received. The gender composition of respondents was 85% men. 55% of the respondents identified as Asian, 33% identified as White. Two preferred not to respond, and there were single respondents for Latino/a/x.

To analyze potential differences in student experiences, participants were grouped based on their retrospective Pre-Module Career Confidence scores. These groups were defined as **Low Confidence (1–4), Medium Confidence (5–7)**, and **High Confidence (8–10)**. Group sizes were 7, 10, and 10, respectively. This grouping facilitated an investigation of how students' initial confidence levels influenced their engagement with the module and their subsequent confidence gains. A difference score (Post-Module Confidence – Pre-Module Confidence) was computed to assess changes in career confidence.

Data Analysis
We conducted Kruskal-Wallis tests to explore differences across the three confidence groups followed by Dunn's post-hoc pairwise comparisons. A Bonferroni correction (adjusted significance level: $p < 0.0014$) was applied to account for multiple comparisons. Given the small sample size, the Kruskal-Wallis test was deemed appropriate; all groups exceeded the recommended minimum of five participants per group.

Results
First data source: When asked about the question, "State three new learnings and/or validations of your beliefs related to your career plans from the exercise this week," students found the exercise helpful and productive overall. The most shared entries were about risk, failure, and opportunity. For example, students said:

- "In my career, I should not shy away from opportunities because of fear of failure. Instead, I should see failure as an opportunity to learn and grow."
- "I need to be less afraid of failure and more willing to just put myself out there; fear of failure or rejection tends to stop me from trying a lot of things."
- "My career development is not a linear process, but a continuous process of learning from small-scale failures and adjustments, perhaps with corresponding setbacks in the growth process, such as failed interviews and the like."
- "Always Have a Plan B: Before this, I was all-in on my main career plan. But laying out my 'what if' scenarios made me realize there are other cool paths I could pursue if my main plan goes sideways. It's pretty reassuring to know that even if Plan A doesn't work out, there are still exciting options to explore."

In some cases, students echoed the language used by the facilitator (e.g., formulating risk as "little bets"). Still, other students wrote reflections that were thematically accurate but in their own words, indicating a level of internalization.

Of the 143 students who provided a reflection, only three students used the word "design" in the context of using design thinking in their career development. All other instances of the word design were technical in nature (e.g., expressing a personal desire to work in analog circuit design). In contrast, 52 reflections included the word "failure." This finding is noteworthy because design thinking is emphasized throughout the module and is a major component of the course in which this module is embedded. Although a design thinking framework helped create space for students to grapple seriously with their futures, it does not seem to be the most obviously resonant aspect of students' module experience.

Given that most of the class is comprised of master's degree students on a tight academic timeline toward targeted careers, and some already in the industry, responses underscored the students' ability to integrate and appreciate career discussion and, interestingly, articulate their lens through which they can also view a career as a life-long endeavor.

Second data source (Survey): Figure 1. presents changes in Career Confidence from Pre-Module to Post-Module, disaggregated by Pre-Module Confidence group (Low, Medium, High). The Low Confidence group exhibited the greatest increase in confidence, suggesting that students

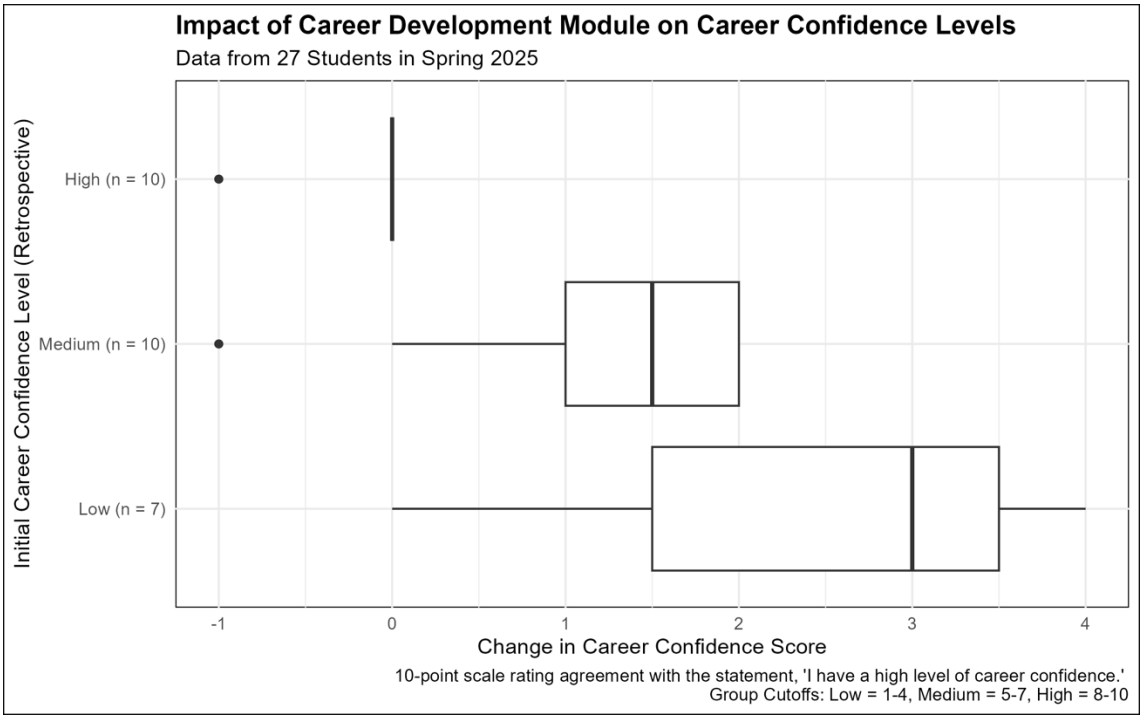

Figure 1. Changes in Career Confidence from Pre-Module to Post-Module, disaggregated by Pre-Module Confidence group (Low, Medium, High).

with lower initial confidence benefited the most from the module. While this effect may partially be attributed to a ceiling effect (where higher-confidence students had less room for growth), it also may indicate that the module may be particularly valuable for students with initially lower career confidence.

No significant differences were found between the Low, Medium, and High confidence groups' ratings of the module's benefits ($p > 0.0014$). This suggests that students, regardless of initial confidence levels, perceived similar value across the module's components.

Significant differences emerged between the Low and High confidence groups on select career beliefs and engineering identity measures. Specifically, students with initially lower confidence reported significantly lower agreement on the following items:

- *I have a strong awareness of why the work I do is meaningful to me.*
- *I feel like an engineer now.*
- *I feel comfortable in engineering.*

These findings suggest that while the module contributed to students' career confidence, additional opportunities for structured reflection and identity development may be beneficial, particularly for students who begin with lower confidence. Integrating more reflective exercises throughout the course may help students build self-awareness about their professional trajectory.

In addition to the quantitative analysis, open-ended write-in responses at the end of the survey help bring to life the student experience of the module. One student said:

> *I loved the career development module- I honestly think it has been the most valuable part of the entire course. I kind of wish we spent more time on things like this that feel like they'll be directly beneficial to me, and I wish we did this in undergrad at [university] too. I think a lot of [university] students graduate with this idea that they need to do something just as or more impressive than getting into [university] after they graduate- move to the bay, climb the corporate ladder, etc., it's nice to think about how many more things there are to consider and how many more life paths there are. I think a lot of kids need that before [a master's program].*

Discussion

The desired outcomes of this studio session are: (1) to sustain high levels of in-class engagement across students and (2) to foster an appreciation of design thinking as a tool to evaluate and reconsider career progress and aspirations. In our experience, students enjoy engaging with this topic. They are very vocal in sharing their thoughts and experiences, such as deciding to pursue graduate studies or pivot into new specializations. Moreover, our findings suggest that creating additional opportunities for reflection may help students develop greater self-awareness about their work and their relationship to engineering.

It is essential to address the multitude of ways that careers may be developed and examined. While design thinking is pervasive and has gained significant traction, it is a heuristic approach and provides quick avenues of inquiry leading to a solution. This approach may or may not lead

to an optimal path for an individual. Avid consumers of career development resources may engage in personality-type surveys, read career guides, join career groups, and seek individualized career coaching for greater insight and career planning. In fact, many companies offer in-house career development and leadership training to build and retain talent. Even earlier, students leverage career resources at academic institutions offering similar personality surveys, individualized coaching, and placement. The DYL framework proved a helpful starting point to develop a set of activities and exercises to spark engineering graduate students to think of themselves as their own customer and design their lives according to their values.

Further, involvement from industry mentors and alums is emerging. Students in the program are included in LinkedIn groups and can reach out for connections and continue their career discovery. Moreover, these groups can continue to enable connections for longer-term surveys to examine the value of the exposure to the DYL module.

Conclusion

Engineering talent is in high demand, but such industries demonstrate cyclical behavior with high growth opportunities counteracted by times of workforce reduction. Additionally, students are presented with a wealth of opportunities in the form of the range of roles an individual can take and the variation in compensation levels. Students are also exposed to a barrage of information about ideal timings for an engineer to switch jobs to remain productive, relevant, and compensated fairly. Thus, by developing self-directed and accessible career reflection skills and tools, we hope to enable our students to not only apply their technical skills and competencies but also to demonstrate agility and embrace change to pursue the career(s) they desire.

References

1. B. K. Jesiek and L.H. Jamieson, "The Expansive (dis) Integration of Electrical Engineering Education," *IEEE Access*, vol. 5, pp. 4561-4573, 2017.
2. E. Lindsay, R. Munt, H. Rogers, D. Scott, and K. Sullivan, "Making Students Engineers," *Engineering Education*, vol. 3, no. 2, pp. 28-36, 2008.
3. D. Satterfield, M. Parker, M. Bahnson, H. Perkins, M. Tsugawa, K. Scalaro, C. Cass, K. Scalaro, and A. Kirn, "Unpacking Engineering Doctoral Students' Career Goal Setting and Future Time Perspectives," In *2022 ASEE Annual Conference & Exposition*, Jun. 2022.
4. A. Furnham and T. Ribchester, "Tolerance of Ambiguity: A Review of the Concept, its Measurement, and Applications," *Current Psychology*, vol. 14, pp. 179-199. 1995.
5. J.M. Brisbane, J. London, and K. Reeves, "WIP: A Pedagogical Intervention Leveraging Engineering Design Thinking to Foster a Tolerance for Ambiguity," In *2022 ASEE Annual Conference & Exposition*, Jun. 2022.
6. IDEO, "Design Thinking Defined," ideo.org. https://designthinking.ideo.com/ (accessed Dec. 15, 2024).
7. B. Burnett and D. Evans, *Design Your Life: How to Build a Well-Lived, Joyful Life,* Knopf Doubleday Publishing Group, New York, NY, 2016.
8. https://lifedesignlab.stanford.edu/resources
9. L. Schram, "Designing Principles for Exploring Your Career," insidehighered.com. https://www.insidehighered.com/advice/2018/01/29/ways-build-career-and-life-beyond-phd-opinion (accessed Dec. 15, 2024).

10. “Design Thinking 101: Design the Ideal Wallet.” teachingentrepreneurship.org. https://www.teachingentrepreneurship.org/design-thinking-101/ (accessed Dec. 15, 2024).
11. A.R. Reeves, Creating Plans for Learning in *Where Great Teaching Begins: Planning for Student Thinking and Learning*, ASCD (Association for Supervision and Curriculum Development) publishing, Alexandria, VA, 2011.
12. B. Burnett, “Odyssey Plans: What is an Odyssey Plan?” youtube.com, https://www.youtube.com/watch?v=wnU5DaIPr2Q (accessed Dec. 15, 2024).
13. P. Bhatti & S. Tridandapani, “Designing your failure portfolio: Capacity building for lifelong learning.” *IEEE Potentials*, vol. 41, no. 4, pp. 11-16, 2022.
14. J.W. Drisko and T. Maschi, *Content Analysis*. Oxford University Press, USA, 2016.
15. A. Godwin, “The Development of a Measure of Engineering Identity,” In *ASEE Annual Conference & Exposition*, Jan. 2016.
16. J. Rohde. L. Musselman, B. Benedict, D. Verdín, A. Godwin, A. Kirn, ... & G. Potvin, “Design experiences, engineering identity, and belongingness in early career electrical and computer engineering students.” *IEEE Transactions on Education*, vol. 62, no. 3, pp. 165-172, 2019.