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Evaluating a Career Design Micro-Course for First-Year Engineering Students

Julia C. Lapan
University of Virginia
School of Engineering and Applied Science
Assistant Dean for Career Development
julia.lapan@virginia.edu | LinkedIn

Anne M. McAlister
University of Virginia
School of Engineering and Applied Science
Assistant Professor
amm8km@virginia.edu | LinkedIn

Abstract: This paper describes the evaluation of a career design micro-course integrated into a required first-year introductory engineering class. The micro-course was a collaborative effort between faculty and career development staff. Rooted in a career design paradigm, the micro-course included practical career development strategies and personal reflection. Pre- and post-course survey data, including the Career State Inventory, indicate how students' career decision state changed by the end of the course. Using quantitative and qualitative data, the paper provides insight into one university's efforts to integrate career development into the academic curriculum, with implications for career development research and practice.

Keywords: career development, career readiness, first-year students, curriculum integration

Over the past decade, there has been much discussion in higher education about supporting college students' career success. As college costs have risen dramatically, the return on investment of a college degree has been increasingly questioned. Students, parents, and government officials have called for more transparency and accountability from higher education institutions around career outcomes that justify the value of a college degree (National Conference of State Legislatures [NCSL], 2024). A recent task force of state legislators on higher education defined education that provides "value," in part, as a program that "lead[s] to desirable life, career and learning outcomes" (NCSL, 2024, p. 9). The stakes may be even higher for the many students who take out loans to finance their college education (Council of Economic Advisors, 2024).

Career services offices, consisting of teams of professionals tasked with supporting college students' career success, have traditionally been positioned on the margins of an institution, often reporting to divisions of student affairs (National Association of Colleges and Employers [NACE], 2019). Their services include workshops and individual career advising sessions that address topics such as resume preparation, job/internship search, and salary negotiation. As career services at most institutions are not a mandatory part of the curriculum, students must seek out career services and "opt in" to take advantage of the offerings. As a result, career services offices typically reach only a fraction of the student population, often too late in a student's college experience to have maximal impact (Nester, 2022). Students' disparate usage of career services can result in inequities in post-college career outcomes. For example, a recent NACE study found that students

who utilized their university's career services averaged more job offers than students who did not (Van Derziel, 2022).

A 2018 report by EAB Global, Inc. contends that "a central career services approach won't be enough" (p. 17) to prepare students for post-college career success. They argue that "institutions should move toward an integrated approach that incorporates student affairs-style parallel programming and more traditional academic programming into a student's career development" (EAB Global Inc., 2018, p. 18). Considering these realities and the call for institutions to put more resources toward supporting student career success, higher education practitioners and thought leaders have begun to urge institutions to integrate career learning into the student experience (Nester, 2022). Career development practitioners have increasingly been leading efforts to weave career learning into the academic curriculum (Gatta et al., 2024). However, evaluating the success of career education in the classroom remains a challenge, and there is a dearth of scholarly research on the topic. This article describes our university's effort to integrate career learning into the academic curriculum and our attempts to measure the impact of those efforts.

Our research makes several contributions to the understanding of impactful career education practice. First, we detail how our institution embedded career and life design concepts into an existing academic course with the goal of developing students' career readiness. Second, we provide insight into how our career development staff partnered with academic faculty to integrate career readiness programming into the classroom. Third, we document quantitative and qualitative strategies for evaluating learning outcomes. Finally, this paper advances our understanding of how the Career State Inventory (CSI), a relatively new instrument in the field of vocational psychology, can be used in career development research and practice.

Background

Career Readiness

NACE defines *career readiness* as "a foundation from which to demonstrate requisite core competencies that broadly prepare the college-educated for success in the workplace and lifelong career management" (2021). NACE has identified the following eight core competencies associated with career readiness: Career and Self-Development, Communication, Critical Thinking, Equity and Inclusion, Leadership, Professionalism, Teamwork, and Technology. The NACE competencies were initially developed in 2015 by a task force that included college career services and HR/recruiting professionals and then refined by two subsequent task forces in 2017 and 2020 (NACE, 2022).

While students may develop various career readiness competencies through curricular and extracurricular experiences in college, this study focuses on the *Career and Self-Development* competency. According to NACE (2021), Career and Self-Development is an individual's ability to "proactively develop oneself and one's career through continual personal and professional learning, awareness of one's strengths and weaknesses, navigation of career opportunities, and networking to build relationships within and without

one's organization." NACE has established the following list of behaviors that demonstrate competency in career and self-development:

- Show an awareness of one's strengths and areas for development.
- Identify areas for continual growth while pursuing and applying feedback.
- Develop plans and goals for one's future career.
- Professionally advocate for oneself and others.
- Display curiosity; seek out opportunities to learn.
- Assume duties or positions that will help one progress professionally.
- Establish, maintain, and/or leverage relationships with people who can help one professionally.
- Seek and embrace development opportunities.
- Voluntarily participate in further education, training, or other events to support one's career. (2021, Career & Self-Development section)

As college career services offices are beginning to pivot away from traditional outcome measures (e.g., starting salaries) and engagement metrics (i.e., numbers of students who attend a career fair or a workshop) and moving toward a *career ecosystem* paradigm (Podany, 2024), the career readiness competencies provide a learning-oriented framework through which to engage students in career development. However, there are limitations to how career development practitioners can measure students' growth in the competencies. For example, the recently launched NACE Competency Assessment Tool (NACE, 2024) relies on student self-reports and faculty, career advisor, and/or employer observations to rate students' competency development. Thus, multiple partners must participate in assessing students' competencies. Furthermore, data from recent student and employer surveys indicate there may be gaps between how students and employers rate students on the competencies (Gray, 2025). Therefore, while a competency-based approach can help educators articulate career learning outcomes, measuring students' progress toward those outcomes is a complex endeavor.

Career and Life Design Framework

While the terms *life design* and, more recently, *career design* have appeared in the vocational development literature as theoretical frameworks for the past two decades (Dean et al., 2020; Savickas et al., 2009), an unrelated, and yet arguably more user-friendly and practical approach to college student career development was developed in 2016 by Bill Burnett and Dave Evans of Stanford University. Burnett and Evans (2016) co-wrote the book, "Designing Your Life: How to Build a Well-Lived, Joyful Life," based on their experiences with college students and guided by positive psychology and design thinking principles. Their career and life design framework has been adapted by career development practitioners globally for use with college students and early- and mid-career professionals looking to design their careers (Catrino, 2022). Some university career centers have even integrated the word "design" into their names. For example, Johns Hopkins University recently rebranded its career services office as the Life Design Lab (Hub Staff, 2019), and Dartmouth College is planning a restructuring of its Center for Professional Development, which will be rebranded as the Dartmouth Center for Career Design (Dartmouth College, 2024).

Through Burnett and Evans' (2016) career and life design framework, students are encouraged to consider their career a design challenge. They are empowered to design their futures using several key principles: engaging their curiosity, having a bias to action, ideating multiple possible pathways, prototyping and testing career ideas, getting support from others (radical collaboration), and reframing questions and problems. Rather than having students view their career development as a linear apply-plus-interview-equals-job equation, the career and life design framework invites students to develop empathy for themselves and others, articulate their values, and reflect upon what kind of impact they want to have in the world. Furthermore, career design encourages students to leverage their unique interests and strengths into a meaningful career through designing small experiments or *prototypes* to test career ideas, connect with others, and design for the future. In summary, the career and life design framework offers a way for students to approach their career development holistically, rather than simply in pursuit of a job.

Career Development Courses

According to Christianson (2021), a career development course can positively influence students' career self-efficacy, defined as students' beliefs in their ability "to manage specific tasks necessary for career preparation, entry, adjustment, or change across diverse occupational paths" (Lent & Brown, 2013, p. 561). Nester (2022) argues that career education courses should be embedded into college curricula to address the needs of every student, particularly to address career indecision. Nester (2022) goes on to say that "if colleges and universities address indecision at the beginning of a student's academic journey, they can improve the overall [college] experience" (p. 207). While career development courses can take many shapes and forms, there is a dearth of published research on the impact of these courses, particularly at the postsecondary level.

Two studies provide insight into measuring the impact of a career course. The first (Prescod et al., 2023) used a qualitative survey to learn about the experiences of STEM-interested students in a three-credit, standalone career planning course. That study found that overall, students responded positively to the course and became more decided about their choice of major. The second study (Miller et al., 2018) used a quantitative instrument, the CSI, to assess the impact of a three-credit standalone college career course. Miller et al. (2018) found that students became more certain, satisfied, and confident after participating in the career course. They also found that outcomes varied depending on whether students were in their early college years or closer to graduation.

At the University of Virginia (UVA), we developed a career design micro-course for engineering first-year students that centers on NACE's career and self-development competency and is rooted in career and life design concepts. This paper attempts to answer the question, "What change, if any, did students report in their career decision state after a two-semester career design micro-course?"

Methodology

Research Site

UVA is a mid-sized, public research institution in central Virginia. It is the flagship public university of Virginia and enrolls close to 16,000 undergraduates. The School of Engineering and Applied Science (UVA Engineering, or Engineering School) has an enrollment of approximately 2800 undergraduate students and 1200 graduate students. Students apply and are admitted directly into the Engineering School, and approximately 700 students matriculate into the program annually. Students can major in any one of nine different programs and can minor in engineering or another discipline (such as business, social sciences, natural sciences, etc.).

UVA Engineering's mission is "to make the world a better place…by preparing engineering leaders to solve global challenges" (University of Virginia School of Engineering and Applied Science, 2025). Our core values include societal impact, innovation, collegiality, and excellence through diversity. These values are imbued throughout the student experience and the academic curriculum. In Fall 2023, UVA Engineering launched a newly designed, year-long Engineering Foundations (EF) course required for first-year undergraduate students. EF explores the fundamentals of engineering and sociotechnical thinking and provides students with tools to succeed in college and beyond. Students are introduced to engineering practice and the design process, the concept of engineering as an endeavor that shapes and is shaped by society, the fundamentals of engineering ethics, and oral and visual communication. Through a partnership with the associate dean for undergraduate affairs and the assistant dean for career development, the Engineering Career Development team designed and embedded a career design micro-course into the larger EF course, detailed below.

Career Design Micro-Course

Career and Self-Development is one of seven learning outcomes of the EF course. In alignment with the engineering design focus of EF, the Career Design Micro-Course utilizes design thinking concepts to promote career and self-development through a career and life design framework based on Burnett and Evans' (2016) *Designing Your Life* curriculum. UVA's Engineering Career Development team created a set of learning outcomes that reflect tasks we believe are an important foundation for first-year engineering students to build career self-efficacy. The learning outcomes of the career design course were as follows:

- Develop a professional resume and Handshake profile
- Reflect on work and life values, interests, and strengths, and translate those insights into design criteria for future careers
- Identify ways to prototype and test career ideas (e.g., through internships, research, projects, extracurricular involvement, volunteering, and other experiences)
- Learn how to research career pathways in engineering and adjacent fields
- Conduct an informational interview with an alumnus or other professional in a field of interest
- Develop an academic and career plan for the remaining college years and one to two years beyond college

The Center for Engineering Career Development team delivered the career design micro-course through four in-class modules spanning the fall and spring semesters. The career design instructional team included the director of career development, the associate director of career development, and two career advisors. Depending on the semester, there were between 18 and 20 sections of the course, and the sections were distributed among each career development staff member so that each instructor taught between four and six sections. Each module was delivered during an entire class period (75 minutes) of the required EF course, and two modules were offered each semester. A description of each of the modules is below. See Table 1 for a brief summary of the micro-course.

Module 1, Early Fall

Students were introduced to the principles of career and life design (Burnett & Evans, 2016) and the micro-course learning objectives during Module 1. They engaged in an in-class reflection around "curiosity" and were encouraged to connect their career designs to their curiosities. During the second half of the class, students were introduced to the basics of resume writing and learned about the university's career platform, Handshake. They were assigned to draft a one-page resume and directed to use VMock, an AI-assisted resume review platform, to score their resume. They were also assigned to take the Life Values Inventory (Brown & Crace, 2002) as a pre-work assignment for Module 2. Students received a personal career journal, created by the career development team, to complement the in-class and out-of-class reflection activities and assignments.

Module 2, Late Fall

For the second module, career advisors returned to class to lead a conversation around "Building a Compass" (Burnett & Evans, 2016, p. 29) and engaging students with their values. The concept of "being instead of achieving" (Rogers, 2016, p. 138) was discussed as a way of getting students to reflect upon their career as a journey that connects to the impact they wish to have in the world, rather than simply as a means to a (financial) end. Students engaged in an in-class Workview and Lifeview reflection (Burnett & Evans, 2016, pp. 34-37) and were assigned a brief written reflection on the integration of their workviews and lifeviews. At the end of the class period, students engaged in a short reflection around their proudest accomplishments as a way to begin to understand their strengths. Finally, they were encouraged to start exploring practical ways to engage their curiosities, values, and skills through undergraduate research, internships, study abroad, and other "high-impact" experiences (Kuh, 2008).

Module 3, Early Spring

Module three was delivered in the early spring semester and focused on "Wayfinding" (Burnett & Evans, 2016, p. 41). Since the students were starting a new course (Engineering Foundations 2) and fresh off their winter break, career advisors reviewed the Career Design principles and engaged students in a creative mind-mapping activity. Using colored pens and pencils, students drew themselves at the center of their map and created spokes to the myriad curiosities, strengths, and values they had identified in the fall. Students were

encouraged to notice connections between the different parts of their mind maps and were challenged to develop "prototypes" (Burnett & Evans, 2016, p. 107), or experiences that would incorporate three or more of their ideas. Students were then given an assignment to learn more about a career pathway that connected to their mind maps by conducting an informational interview with an alumnus or other professional of their choosing. Some basic tips on how to connect with professionals and conduct an informational interview were discussed in class.

Module 4, Late Spring

In the final module, career advisors convened the course by asking students to share their experiences with the informational interviews. Then, students used the in-class time to develop Odyssey Plans (Burnett & Evans, 2016, p. 96), which entailed creating three alternative versions of their lives for the next 5 years. Students were encouraged to include academic, career, and personal goals in their Odyssey plans, and were assigned an out-of-class "meta-reflection" that asked students to integrate everything they learned through the micro-course. Advisors invited students to keep designing their careers beyond the conclusion of the course, and were told about the career advising and other resources at the university to help them on their journeys.

Research Methods

We assessed learning outcomes for individual students through each of the four modules by completing in-class and out-of-class written assignments tracked by the course teaching assistants. The career design assignments were factored into students' course grades, comprising ten percent of their overall course grade. Our primary research method allowed us to document observable learning outcomes aligned with the career and self-development competency. For example, NACE suggests that students "display curiosity," "show an awareness of one's own strengths," and "establish relationships with people who can help one professionally" (Career & Self-Development Competency; NACE, 2021). Through engaging in curiosity and strengths reflections during class, students worked on their self-awareness and began cultivating their professional community through the informational interviews. As the career readiness competencies provide only a guide to career development and not an endpoint, we view the activities as lifelong career management behaviors and, therefore, cannot measure them quantitatively.

However, our team felt that a quantitative measure of students' career development would also be helpful to better understand how students' thoughts, feelings, and attitudes around their careers did or did not change through their first year. To assess the impact on students' career readiness, we sought an externally validated instrument that would lend itself to a pre- and post-course design that could be readily administered as part of a larger course evaluation survey. The CSI (Leierer et al., 2025) is a validated instrument that

Table 1. *Details of Career Design Micro-Course*

Module Component	Module 1 Early Fall	Module 2 Late Fall	Module 3 Early Spring	Module 4 Late Spring
Theme	Intro to Career and Life Design Framework	Building a Compass	Wayfinding	Odyssey Planning and Course Wrap-up
In-Class Activity	● Introduce micro-course objectives ● Curiosity reflection ● Handshake overview ● Resume 101	● Values discussion ● Workview/Lifeview guided reflection ● Strength reflection ● Exploring the University: Resources for the first year and beyond	● Mind mapping ● Prototyping ideation ● Introduction to informational interviews and networking	● Career design interview debrief ● Introduction to Odyssey planning ● Course wrap-up
Out-of-Class Activity	● Resume draft ● Life Values Inventory (pre-work for Module 2)	● Workview/Lifeview integration essay	● Career design (informational interviews)	● Odyssey plans (3 alternative plans for the next 5 years)

measures students' career decision state as a composite of their certainty, satisfaction, and clarity regarding their career choices. Certainty is measured by a two-part, open-ended question about occupations that the student is considering. Responses to these questions are then assigned a score between 1 and 4, with 1 being more certain and 4 being less certain. Satisfaction is measured by asking students to rate their satisfaction with their previously listed occupations on a 5-point Likert scale that ranges from 1 (very satisfied) to 5 (very dissatisfied). Finally, clarity is measured by three true-false questions, where each true response is given a score of 1 and each false response is given a score of 0. The total clarity score is the sum of the three true-false scores, where a 0 indicates a high level of career decision-making clarity and a 3 indicates career decision-making difficulty.

Total CSI scores, the sum of the three sub-scores, range from 2 to 12, indicating at the low end that a student is goal-directed, satisfied, clear, and confident in their career decision making and indicating on the high end that a student is frozen, dissatisfied, confused, and lacking confidence in their career decision (Leierer et al., 2025). Leierer et al. (2025) suggest the CSI can be used to measure the change in career decision state of a group following an intervention, such as a career course or workshop. Thus, we felt the CSI was an appropriate instrument to measure any change in career decision state for our students who participated in the career design micro-course.

Participants

First-year engineering students who participated in the career design modules in the 2023-2024 academic year were asked to complete the CSI at two points in time: once at the start of the Fall 2023 semester, in mid- to late September, before the career design modules took place, and once again at the end of the Spring 2024 semester, in late April or early May, after completing all four career design modules and a year of engineering courses. Over 700 first-year engineering students were enrolled at the time of the study. However, of the students who consented to let us use their data for research purposes, only 62 students completed both the fall and spring administrations of the surveys. The scores from these 62 students make up our final dataset. In our dataset, 48% of students (n = 30) are women and 52% (n = 32) are men. Further, 60% (n = 37) of the students in our sample are White, 18% (n = 11) are Asian, and 11% (n = 7) are Hispanic, Black, or African American. Women and White students are overrepresented in our sample compared to the overall undergraduate population of the School of Engineering (approximately 34% and 50%, respectively).

In addition to the CSI (quantitative measure of students' career decision state), we included one qualitative question to assess students' overall takeaway from the career design micro-course. It is important to note that while the CSI is a quantitative measure, some qualitative data can also be gleaned from students' responses. More specifically, students are asked to list their top career choices, and the response is open-ended. Therefore, we can assess whether students' top career choices changed from the fall to the spring semester, and we can mine the data for trends in career choice goals across the student cohort.

Analysis

We treated students' scores as having equal intervals in the following analysis to make comparisons and run statistical tests. We ran paired t-tests on students' total CSI scores and the CSI certainty, satisfaction, and clarity sub-scores to test for significant changes in scores between fall and spring. A paired t-test is appropriate given our larger sample size.

Researcher Positionality

Both of this study's co-authors participated as instructors in the EF course. Dr. Anne McAlister is an engineering school faculty member who was hired to teach the first-year EF course. She was the primary instructor for four sections of the course in the fall semester and was on leave in the spring, so she did not teach a spring course. Dr. McAlister holds a bachelor's degree, a master's degree in engineering, and a Ph.D. in education. Dr. Julia Lapan has over twenty years of experience as a higher education administrator, primarily in college student career development, and has led the design and integration of the career design micro-course. Dr. Lapan has an Ed.D. in higher education and served as director of career development for UVA Engineering when this course was delivered.

Results

CSI Total Scores

On average, students' total CSI scores decreased in the spring compared to the fall, as did their sub-scores for certainty, satisfaction, and clarity (Table 2). Students' total CSI Scores were shown to decrease from an average of 6.69 in the fall to an average of 5.95 in the spring. Alpha was set at .05, which resulted in a significant difference using a paired t-test ($t(61) = 2.76$, $p = 0.008$).

A graph of the number of students who had each possible CSI score in the fall and spring demonstrates how the scores were not normally distributed, with peaks at scores of 4 and 7 for the spring and peaks at 5, 7 and 10 for the fall (Figure 1). The difference between spring and fall was calculated for each student, and these scores ranged from -6 to 4 (Figure 2). Close to half of the students' total CSI scores (48%, $n = 30$) decreased from the fall to the spring semester. The remaining students either had no change (26%, $n = 16$) or had increased scores (26%, $n = 16$). Further, the absolute value of the change in scores was larger for the students whose scores decreased than for those whose scores increased. Only two students had total scores that increased by more than two points.

Table 2. *Average CSI Scores*

	M			*Paired t-test*		
	Fall Score	Spring Score	Difference	*df*	*t*(61)	*p*
Total CSI	6.69	5.95	-0.74	61	2.76	0.008*
Certainty	2.34	2.24	-0.10	61	1.10	0.277
Satisfaction	2.58	2.42	-0.16	61	1.18	0.242
Clarity	1.77	1.29	-0.48	61	3.73	<0.001*

*$p < .05$

Figure 1. *Total CSI Scores in Fall and Spring*

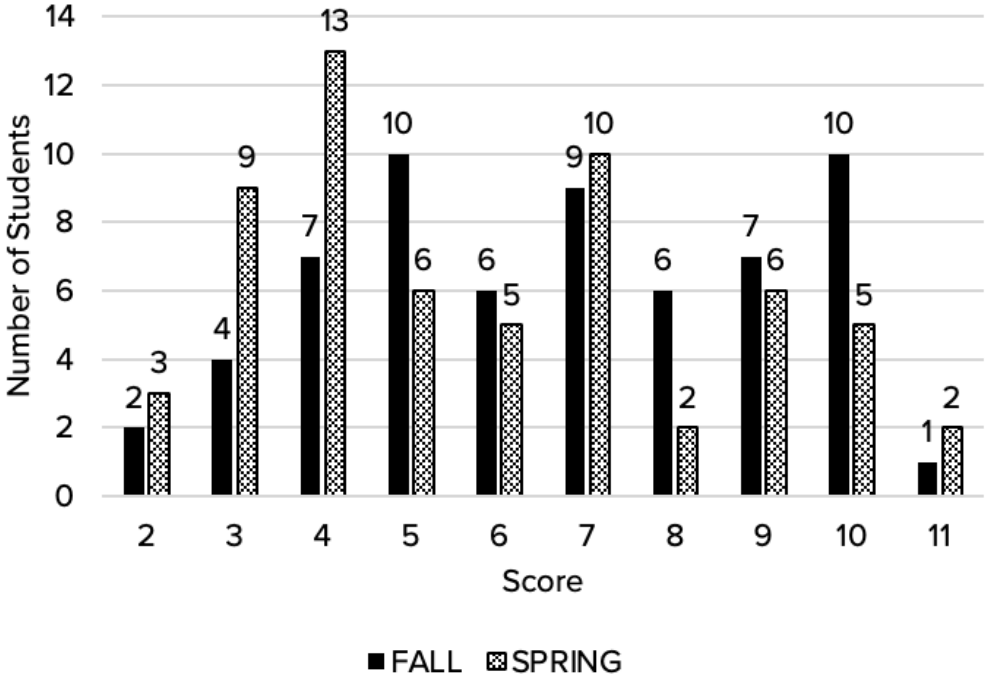


Figure 2. *Total CSI Score Differences Between Spring and Fall*

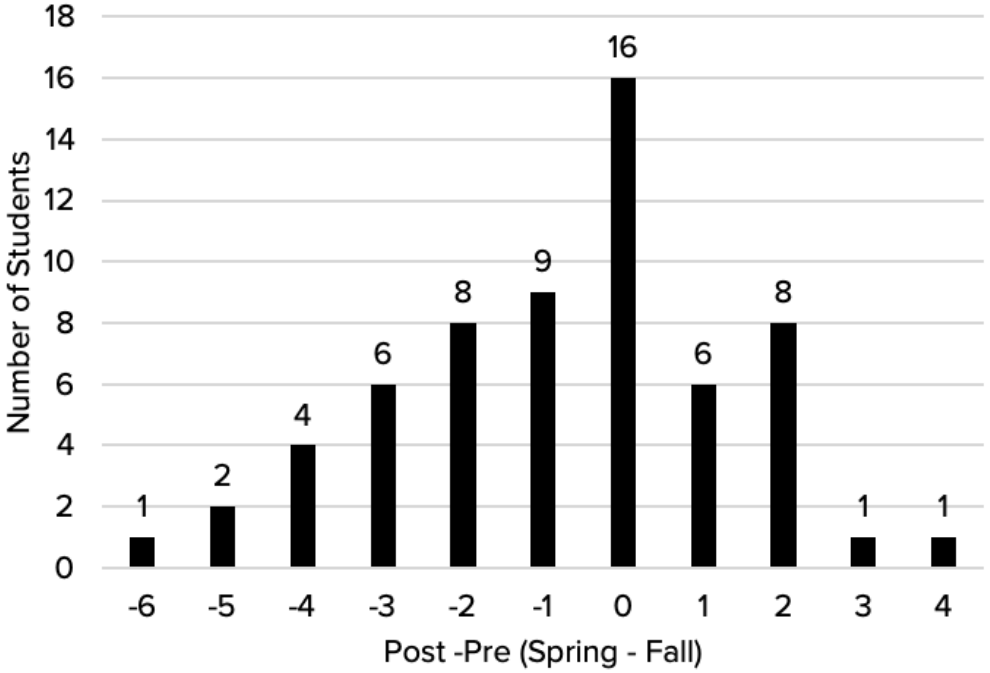


Table 3. *Average Total CSI Scores*

Change in Total CSI Score	Average Fall Score	Average Spring Score
Decreased	7.6	5.1
Stayed the same	5.9	5.9
Increased	5.8	7.6

When we examine these three groups of students (decreased, stayed the same, and increased) more closely (see Table 3), we note that the average fall semester score for students whose total scores decreased was higher (M = 7.6) than the average fall scores of students whose scores stayed the same (M = 5.9) or increased (M = 5.8). Then the average spring semester score for students whose total scores decreased was lower (M = 5.1) than the average spring scores of students whose scores stayed the same (M = 5.9) or increased (M = 7.6).

In summary, students' total CSI scores and subscores for certainty, satisfaction, and clarity decreased on average in the spring compared to the fall, which was expected as students gained clarity and confidence in their career decisions throughout their first year. While close to half (48%, n = 30) of the students had total CSI scores that decreased, the other 52% (n = 32) had scores that stayed the same or increased from the fall to the spring semester, and these students generally started with lower average scores in the fall. While shifts in certainty and satisfaction subscores were not statistically significant, the shift in the average score on the clarity dimension was significant, indicating an overall movement toward increased career clarity. Sub-scores for certainty, satisfaction, and clarity generally followed the same pattern of increasing, decreasing, or staying the same as the total CSI scores.

Course Takeaways

In the post-course survey, we asked, "What is a key takeaway from the career design sessions?" Students' responses ranged from acknowledging that they have many career options, becoming aware of career resources, or citing a connection between their values and career choices. Some students expressed neutral or even negative comments about the usefulness of the career course. We found similar responses for students depending on whether their total CSI score decreased, increased, or stayed the same. Students whose scores increased or stayed the same expressed more negative feelings about the career design sessions, saying things like, "they haven't been very helpful," "they seem kind of useless," and "they were kind of a waste of time." Students with increasing scores also expressed more stress about career decisions, saying, "it is still very stressful and worrisome," and "it sounds very stressful." Students whose scores stayed the same often cited the importance of centering their values in their career decisions as a key takeaway from the course, saying things like, "[I] listen to my values and not the expectations I feel of me" and "the choice ultimately comes from me and should be decided on my personal values and beliefs."

In contrast, students whose total CSI scores decreased more frequently expressed that the career design sessions exposed them to "new opportunities" and that "it is okay to bounce around." Additionally, they said things like, "there are lots of resources at the engineering career center," "UVA has a lot of career resources that are available to students," and "I have resources to go to when I feel lost about my future career." These statements indicate that students whose scores decreased became aware of resources related to career design and felt supported in their career design path.

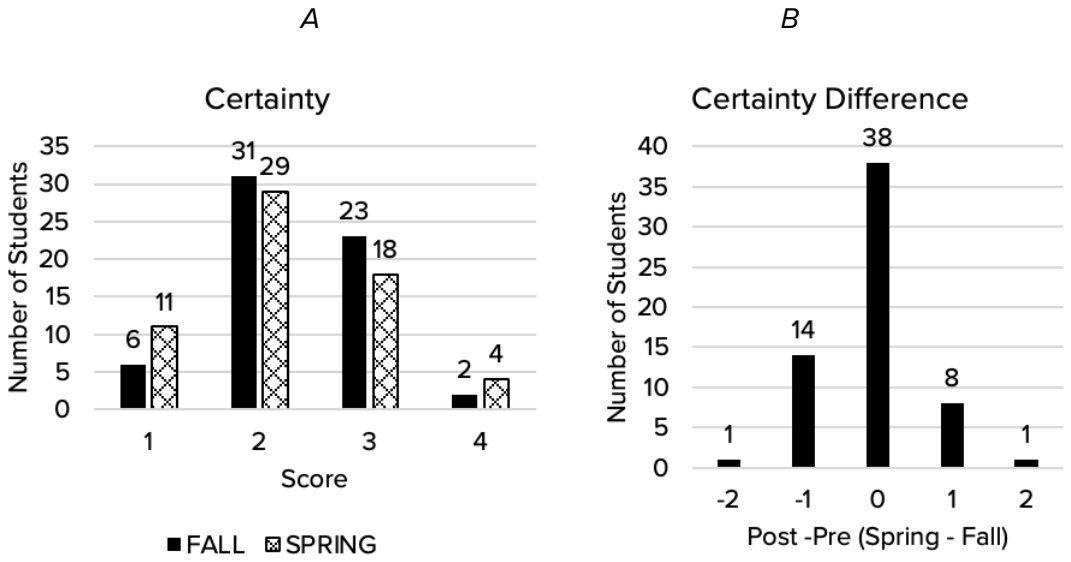
Occupational Alternatives

We notice another trend when we look at students' reported first-choice occupation in the fall vs. spring. Students whose total CSI scores decreased mostly reported the same first choice occupation from fall to spring (*n* = 19, 63%) or became more specific in their choice (*n* = 8, 27%; e.g., undecided in the fall, environmental engineer in the spring). None of the students whose total CSI score decreased became undecided (e.g., biomedical engineer in the fall, undecided in the spring). In contrast, choice goals for four students (25%) whose total scores increased became undecided, nine (56%) remained the same (or remained undecided), and only two (13%) became more specific. For students whose total scores stayed the same, most (*n* = 10, 63%) reported the same first choice occupation in the spring; three students (19%) changed their first choice occupation, and two students (13%) became more specific. One student from this group (6%) became undecided.

CSI Sub Scores: Certainty, Satisfaction, and Clarity

Students' average sub-scores for certainty, satisfaction, and clarity decreased from fall to spring. This difference in clarity scores was significant at the alpha < 0.05 level, while the differences for certainty and satisfaction were not significant (Table 2). Taking a closer look at students' certainty scores, our graphs (Figure 3) show that most students (*n*=38, 61%) did not change in certainty between fall and spring, and more students had a decreasing certainty score (*n* = 15, 24%) than an increasing certainty score (*n* = 9, 15%).

Figure 3. *Certainty Scores (A) and Differences in Certainty Scores (B)*



Students' satisfaction scores followed a similar trend to the certainty score (Figure 4), with most scores around 2 or 3. Again, many students (*n* = 25, 40%) did not change in satisfaction between fall and spring, and more students had a decreasing satisfaction score (*n* = 22, 35%) than an increasing satisfaction score (*n* = 15, 24%).

Students' clarity scores were distributed such that the highest and lowest possible scores were most common (Figure 5), leading to a bimodal distribution. Again, however, most students (*n* = 36, 58%) did not change in clarity between fall and spring, and more students had a decreasing clarity score (*n* = 22, 35%) than an increasing clarity score (*n* = 4, 6%).

Figure 4. *Satisfaction Scores (A) and Differences in Satisfaction Scores (B)*

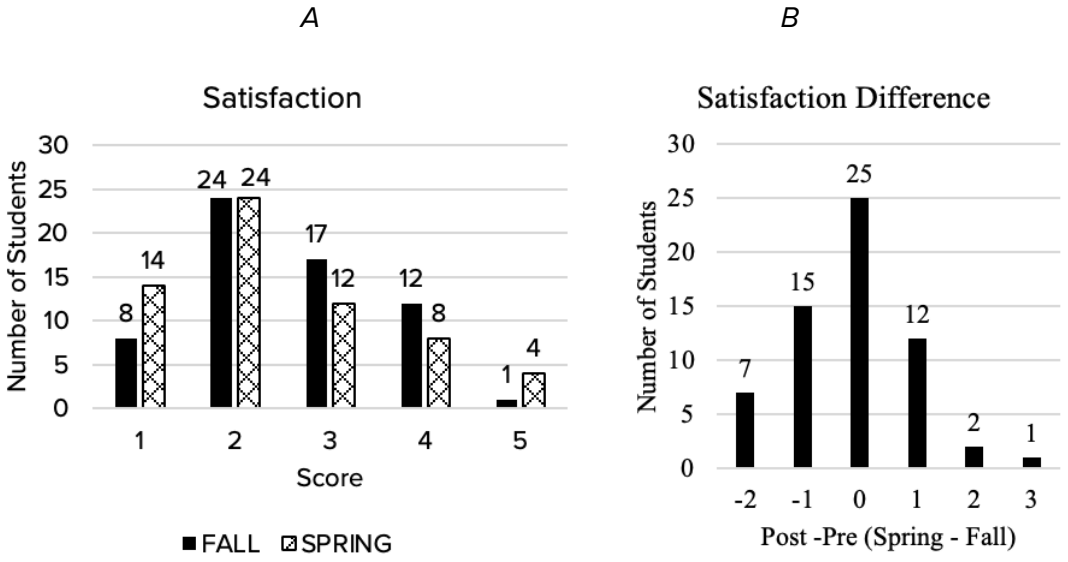
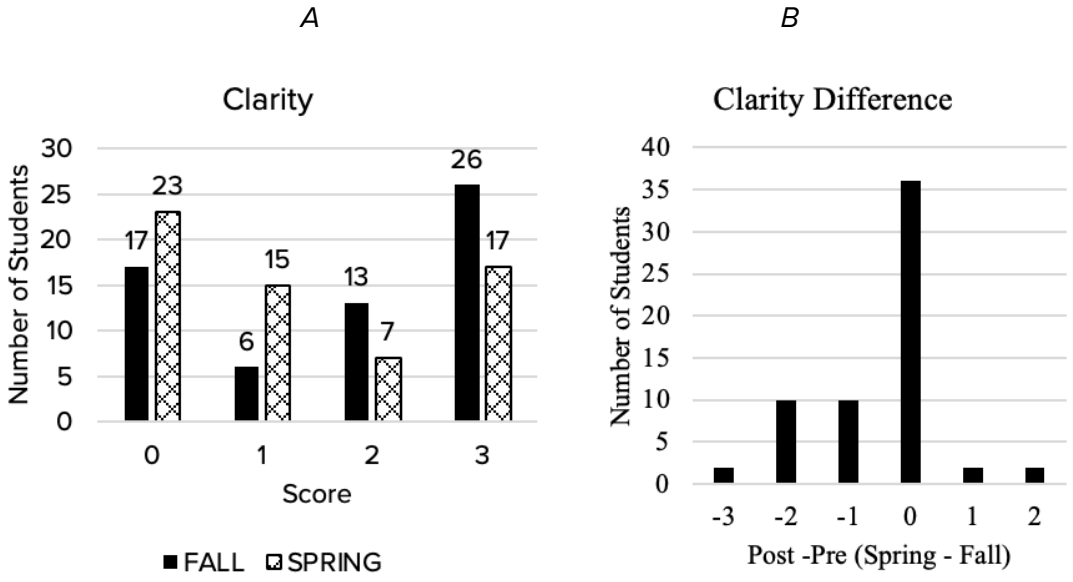
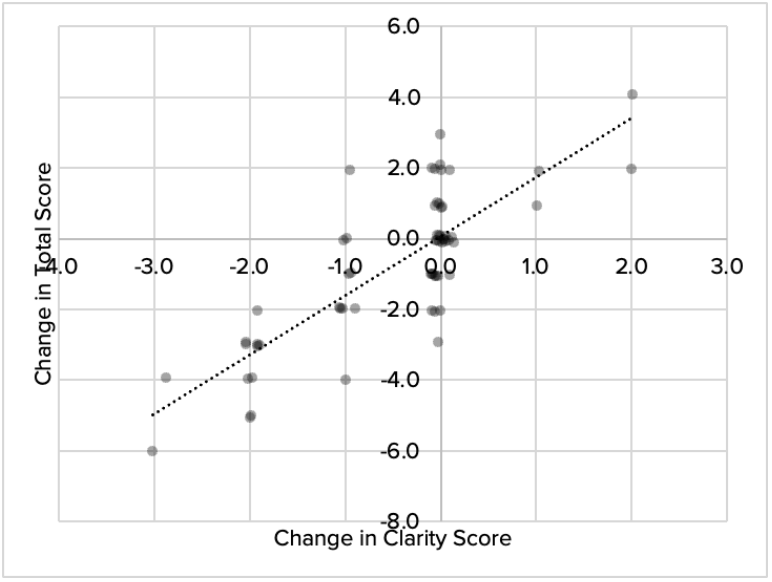


Figure 5. *Clarity Scores (A) and Differences in Clarity Scores (B)*



For all but three students whose clarity score decreased, their total score also decreased. There was a significant correlation between change in clarity and change in total score ($F(1,60) = 102.60$, $p < 0.001$; Figure 6).

Figure 6. *Change in Clarity by Change in Total Score*



Discussion

The scores on the CSI and the qualitative responses from the students begin to paint a picture of how students' career decision states changed from the beginning to the end of the first-year career design course. Overall, the average CSI scores decreased slightly, from 6.69 in the fall to 5.95 in the spring, a movement we would have expected to see after a career intervention. The decrease reflects an overall movement of the students' career decision state away from one that is uncertain, doubtful, and tentative, toward one that is goal-directed, satisfied, and confident. In looking more closely at the distribution of scores, however, we observed that students fell into one of three categories: those whose overall scores decreased, those whose overall scores increased, and those whose overall scores remained unchanged. We will discuss each of these in more detail.

Total Career Decision State

The largest group of students (48%, $n = 30$) had total CSI scores decrease from the fall to the spring semester, indicating they became more confident in their career plans. As stated previously, it is reasonable to expect their scores to decrease during their first year in college, perhaps due to the career design course, but also because of other experiences during their first year in college. For example, attending a university career fair or major selection night, talking with faculty and peers, or meeting with a career advisor may all have impacted their career decision state in bringing more clarity to their career goals. It should be noted that the students in this first (overall score decrease) group started with a higher total CSI score (7.6) to begin with than the other two groups (5.9 for the students whose scores remained the same, and 5.8 for students whose scores increased). Based on

these data, we can infer that the students whose total scores decreased entered college feeling less sure about their career goals than the other two groups.

The second group of students (26%, *n* = 16) saw an increase in their overall CSI score from the fall to the spring semester. While movement in this direction initially felt counter to our goal of supporting students' career success, this increase in total CSI score may be a positive change for some students. This group of students' fall scores were lower than the first group of students to begin with, indicating that they entered college feeling more confident and certain in their career goals than the other two groups. While we ultimately desire students to reach a state of career readiness, too much "readiness" early on can limit students' potential and stymie exploration around their curiosities. This phenomenon has been referred to as occupational foreclosure, in which students focus only on one career goal to the exclusion of all others (Shaffer & Zalewski, 2011). Thus, students who may have entered college foreclosed about their career options might have expanded their perspectives during their first year. As Christianson (2021) found, students in a life sciences career course at Arizona State University reported an increased awareness of career options. While we did not have a chance to interview students about their response to the career design course, we theorize that students became more aware of their career options through the course, but perhaps did not yet have time to explore their options. This realization that there are more options than they have had a chance to explore could feel unsettling for some students.

The third group of students (26%, *n* = 16) had total CSI scores that remained unchanged from the fall to the spring semester. The average score of this group was 5.9. This indicates that students' career decision states started and ended toward the middle of the CSI scale, in a state of being uncertain, having doubts, and feeling tentative about their careers, but far from being frozen, dissatisfied, and confused (represented at the high end of the scale).

CSI Component Scores

For the entire cohort of students, the clarity dimension was the only component score that showed a significant change. The clarity dimension measures vocational clarity, which Leierer et al. (2025) define as "an indicator of one's vocational self-confidence in pursuing the challenging task of career decision-making" (p. 6). In the case of our student sample, the average clarity score decreased from 1.77 in the fall to 1.29 in the spring (on a scale of 0 to 3), with most students reporting no change in career clarity. The clarity component appears to have driven the overall decrease in total CSI scores. It could indicate that through the first year of college, students, on average, gained vocational clarity and confidence in their career decision-making. This change is a desired outcome of any career intervention, even in the first year of college, as despite having multiple possible career paths and being undecided about which path to choose, having more confidence and clarity in their ability to make a career decision can be a positive state from which students can explore and design their careers.

While students' scores on the two other sub-scales (certainty and satisfaction) did not change significantly, it may be that those dimensions will change over time, as students

progress through college and explore their career options through experiences such as internships and interactions with professionals (alumni and employers) and their peers.

Limitations

This study has several limitations. First, our sample size was much smaller than we had originally anticipated. We experienced some challenges in getting the overall course survey approved by our institutional review board. Thus, we had to seek retroactive consent from participants to be included in the study. As this was the first year of delivering the EF course, with many newly hired instructors and a career advising team completely new to teaching career design, we were learning by doing. We therefore had to remain flexible to student demands while attempting to maintain continuity across 20 course sections. Dr. Lapan piloted the career design modules in various forms for several years prior to integrating with EF. However, the integration itself posed several administrative challenges, such as advisors gaining access to Canvas (teaching) sites, scheduling the career design modules to fit instructors' teaching schedules, and reviewing student assignments on a large scale.

Other limitations include that we assessed student development over a limited amount of time (i.e., their first year in college) and used a non-experimental design. Therefore, we cannot confidently attribute changes in the CSI score to the career design micro-course. As alluded to previously, changes in students' career decision state may have been caused by factors unrelated to the career design course. To understand how the career design micro-course impacts students over time, tracking students' CSI scores along with other quantitative and qualitative measures through their remaining college years will be useful. For example, we could interview students about their learning in the career design micro-course. However, it would be unlikely that students could articulate the impact until closer to graduation, or maybe even after graduation. It will be important to develop other methods to assess the impact of this career intervention.

In addition, the CSI instrument itself is relatively new to research and practice. The "certainty" dimension is subjective in that researchers must make decisions about how to score open-ended responses. The fourth edition of the CSI manual (Leierer et al., 2025) offers detailed instructions on scoring procedures. However, in some cases, researchers must make a decision that could affect the quantitative results. In the case of our study, both researchers discussed any gray areas and made a joint decision about the final score to increase our study's trustworthiness.

Implications for Research and Practice

While the CSI is not a perfect tool for assessing a career intervention such as the one we implemented, we found it useful to see how students' career decision states shifted across their first year in college. The fact that the clarity component seemed to be the most malleable suggests that to support first-year students' career development, focusing on helping students clarify their career goals might have the biggest return on our investment. Further research could explore how the other CSI component measures (certainty and satisfaction) might shift as students progress through college.

Our research also suggests that students arrive at college at varying states of career readiness. Going forward, we might investigate designing different interventions for students depending on where they are in their career decision state. For example, for students who begin college with a strong sense of what they want to do (occupational certainty), we could help them see that there is not one "right" path and encourage them to explore a variety of options. This tactic is supported by engineering educators who aim to dismantle systems of domination in engineering by helping students reimagine engineering work as it aligns with their values (Koh & Rossman, 2021). On a more practical level, helping engineering students design alternative career plans can help them develop the "learner" mindset they need to adapt to a rapidly changing career landscape (Chakrabarti et al., 2021). Conversely, for the students who arrive at college feeling frozen or confused about their career choices, we can help them gain clarity around their curiosities, values, and strengths, and empower them to develop career goals based on those insights.

Conclusion

Overall, the career design micro-course was a positive experience for students and instructors. By the end of their first year in college, every engineering student experienced in-person time with the school's career development professionals. All students created a resume; all conducted an informational interview; all reflected on their work and life values; and all were introduced to resources to begin prototyping and testing their career interests. These outcomes mark a dramatic improvement from what students had previously experienced in their first year with regard to career development. Anecdotally, our career advising team has had meaningful career conversations with students, now in their second year, and it is clear from those conversations that they have begun to think about their career in ways we had not seen from second years previously. Additionally, some faculty have remarked that students applying for research positions in their labs seem better prepared (such as already having a resume).

Another benefit of this course is that it has opened the door for students, faculty, and administrators to begin having career conversations early in college. Since the EF faculty also serve as first-year students' academic advisors, career conversations can more readily occur in the context of academic advising. Furthermore, by engaging directly with students, the career development team has gathered new insights that have informed career programming outside the course. For example, when "concern for the environment" emerged as a top value for students, the career team launched an Environmental Pathways initiative highlighting resources and opportunities for students to engage in careers related to environmental sustainability. Going forward, our challenge will be scaffolding students' career development in years two through four. While the career team's staff size and resources present a challenge in our capacity to accomplish this, we are confident that by working with our academic partners, we will find a way to continue to offer career education at scale, helping students to not only secure employment, but to design lives and careers with meaning and purpose.

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