

Transitioning Students to Professional Engineering Careers through the Career Passport

Dr. Jason Andrew Roney, University of Denver

Dr. Roney is currently the Associate Dean of Undergraduate Studies in the Ritchie School of Engineering and Computer Science and a Teaching Professor of Mechanical Engineering. Dr. Roney joined the University of Denver (DU) in Autumn 2014. Prior to joining DU, Dr. Roney held both industry and academic positions.

Dr. Michelle B. Sabick, University of Denver

Dr. Michelle Sabick currently serves as the Dean of the Ritchie School of Engineering and Computer Science at the University of Denver. Dr. Sabick launched her academic career at Boise State University, where she co-founded the Center for Orthopaedic and Biomechanics Research and chaired the Department of Mechanical and Biomedical Engineering. She holds a BS in Biomedical Engineering from Case Western Reserve University and earned her MS and PhD degrees in Biomedical Engineering from the University of Iowa. Dr. Sabick's research centers on orthopedic biomechanics, with a particular focus on the impact of throwing movements on upper extremity joints. She is a Fellow of the American Society of Biomechanics and passionate advocate for inclusive and effective STEM education.

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The evolving landscape of education and employment necessitates innovative approaches to help students successfully transition from academic environments to professional careers. This paper outlines the creation of the "Career Passport" for University of Denver (DU) engineering students. The "Career Passport" is a digital record designed to track the skills and competencies acquired by our students during their education, both inside and outside the classroom. The passport helps students make sense of their academic curriculum, plan their courses and co-curricular experiences intentionally, and document and showcase the competencies they have gained while at DU for future employers. During the first year of our program, assessment rubrics for evaluating four student competencies were developed; the competencies are teamwork, communication, critical thinking/problem solving, and time management. These four competencies were determined as the top skills requested by engineering employers in a survey conducted by the engineering school and found in a literature review. These skills are typically developed in experiential learning during DU engineering courses or during internships. Once the assessment rubrics were established for these four competencies, tracking tools were deployed with support from the Office of Information Technology (OIT), the Registrar's office, and a chosen software vendor. A pilot program is set to begin in early 2026 for tracking these skills for up to 20 students. Additional engineering skills and their assessment will be added in future years to the "Career Passport". Ultimately, the "Career Passport" will be a differentiator for all DU's undergraduate and graduate engineering programs, providing career ready students that will be highly employable upon graduation.

Introduction

The University of Denver is introducing the "Career Passport", a digital tool that tracks engineering students' skills and competencies gained through coursework and co-curricular activities. Its purpose is to help students plan their academic journey, document achievements, and present these to employers. In its first year, rubrics were developed for four key competencies—teamwork, communication, critical thinking/problem solving, and time management—identified as top employer priorities. These skills are primarily cultivated through experiential learning and internships. With support from campus offices and a software vendor, tracking tools have been implemented, and a pilot program for 20 students will launch in early 2026. Plans include adding more engineering skills in future and positioning the "Career Passport" as a distinctive feature that enhances graduates' employability. A schematic outline of the "Career Passport" implementation discussed in this paper is shown in Figure 1.

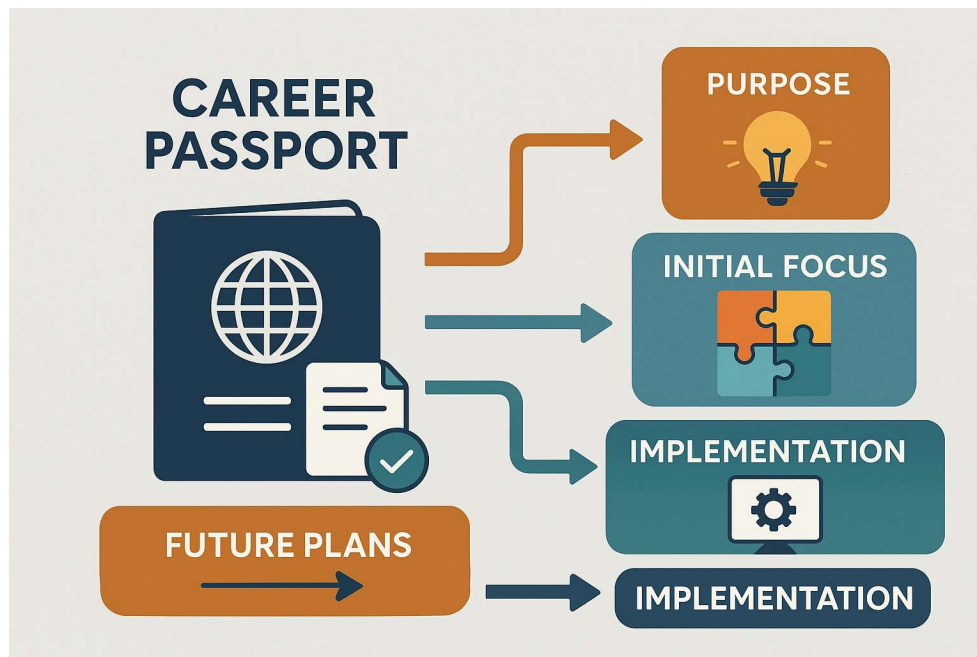


Figure 1. Schematic outline of the “Career Passport” implementation discussed in this paper.

The basis for these initial skills was established by reviewing the existing literature on engineering education and by surveying alum and industry professionals. In [1], the professional skills identified in Bachelor of Science level engineering advertisements as the top professional skills were “Complex Problem Solving”, “Systems Analysis”, “Coordination”, “Science”, “Learning” and “Writing”. In a scoping review in [2], the authors prepared a scoping literature review on skills development in engineering encompassing a 40-year time span (1980–2020). The six specific engineering professional skills that were identified most were “communication”, “teamwork”, “problem solving”, “leadership”, “project management” and “entrepreneurship”. In [3] engineering practitioners were surveyed, and the important skills were mapped to these six themes: “Self-management and personal awareness”, “Engineers’ responsibilities”, “Human collaboration”, “Processes”, “Engineering knowledge”, and “Career Thinking”. Under these themes, “Self-management and organization”, “Communication”, “Teamwork” and “Problem solving skills and processes” were listed as skills in these themes. In [4], the authors ask, “Among generic engineering competencies, what is the relative importance for professional practice across disciplines and work contexts?”. In their study, the authors in [4] identified 52 studies (27 quantitative and 25 qualitative) that address what competencies engineers need, and which are most important. Their review integrates a quantitative synthesis inspired by meta-analytic and a qualitative thematic analysis to establish a comprehensive list of generic engineering competencies. In addition, this study created a list of competencies mapped to ABET outcomes. In their study, the four most important skills were identified as “Planning & time management”, and three ABET mapped competencies, “Problem Solving”, “Communication”, and “Teamwork”.

In addition, at the University of Denver, a committee convened as part of planning the school strategic plan to independently establish the desired student competencies for engineering. Through additional committee work and surveys, competencies were established over a 6-month study period. The four competency areas that were established in the engineering college were the following: “Capability (Technical Skills in the Profession)”, “Coordination (Project Management and Teamwork)”, “Communication (Presenting and Writing)”, and “Critical Thinking”.

Based on the literature review and the engineering college self-study, it became evident that these four key competencies, “teamwork”, “communication”, “critical thinking/problem solving”, and “time management” are essential skills for our engineering graduates. These skills are universal “professional” skills and competencies that should thus be tracked in a “Career Passport” and are part of the first pilot program.

Methods

Mapping to NACE-Based Competencies

Rather than re-invent the method to evaluate these four universal competencies, we turned to the National Association of Colleges and Employers (NACE) competency assessment tools [5]. Established in 1956, NACE is a professional association that connects over 17,000 college career services professionals [6]. As part of its mission NACE has established career readiness competencies; career readiness is a foundation from which to demonstrate requisite core competencies that broadly prepare the college educated for success in the workplace and lifelong career management. The eight NACE career readiness competencies are “Career and Self-Development”, “Communication”, “Critical Thinking”, “Leadership”, “Equity and Inclusion, Leadership”, “Professionalism”, “Teamwork”, and “Technology”. These career readiness competencies can be demonstrated in a variety of ways. NACE provides supplemental materials to support and incorporate initiatives which may include these competencies. For higher education, career readiness provides a framework for addressing career-related goals and outcomes of curricular or co-curricular activities, regardless of the student’s field of study [7]. For our first pilot, we chose the four NACE competencies: “Communication”, “Critical Thinking”, “Teamwork” and “Professionalism” to evaluate “teamwork”, “communication”, “critical thinking/problem solving”, and “time management”.

For each of these competencies we chose the most relevant dimensions of each assessment tool rather than all the dimensions to evaluate. A description of each of the assessments described in [5] is provided along with the part of the assessment tool that we chose in Tables 1 to 4. For the “communication” competency, we chose the NACE “Communication” assessment tool and two of four dimensions, “Oral Communication” and “Written Communication”. For the “critical/problem solving” competency, we chose the NACE “Critical Thinking” assessment tool and two of three dimensions, “Gather & Analyze Data” and “Make Effective & Fair Decisions”. For the “teamwork” competency, we chose the NACE “Teamwork” assessment tool and all three

dimensions, “Build Relationships for Collaboration”, “Respect Diverse Perspectives” and “Integrate Strengths”. For the “time management” competency, we chose the NACE “Professionalism” assessment tool and one of three dimensions, “Achieve Goals”.

Table 1. NACE-based Communication Assessment Tool (chose two of four dimensions) [5]

Communication: Clearly and effectively exchange information, ideas, facts, and perspectives with persons inside and outside of an organization. N/O = Not Observed

Dimension	1 Emerging Knowledge	2 Understanding	3 Early Application	4 Advanced Application	N/O
Oral Communication	Recognizes the elements of effective oral communication skills, such as asking appropriate questions.	Understands how to use oral communication skills to convey meaning.	Sometimes uses effective oral communication skills to convey meaning.	Consistently uses effective oral communication skills to convey meaning.	
Written Communication	Recognizes the elements of effective written communication skills, such as using clear topic sentences and providing evidence to support claims.	Understands how to use written communication skills to convey meaning.	Sometimes uses effective written communication skills to convey meaning.	Consistently uses effective written communication skills to convey meaning.	

Table 2. NACE-based Critical Thinking Assessment Tool (two of three dimensions chosen) [5]

Critical Thinking: Identify and respond to needs based upon an understanding of situational context and logical analysis of relevant information. N/O = Not Observed

Dimension	1 Emerging Knowledge	2 Understanding	3 Early Application	4 Advanced Application	N/O
Gather & Analyze Data	Recognizes the role of data gathering and analysis in fully understanding a problem.	Understands how to gather and analyze data to solve a problem.	Sometimes gathers and analyzes data to solve a problem.	Consistently gathers and analyzes data to solve a problem after considering the quality of the data.	
Make Effective & Fair Decisions	Recognizes the need to objectively assess situations using relevant information from a variety of perspectives to make effective and fair decisions.	Understands the elements of effective decision-making and problem-solving, such as problem identification, identifying values, and determining solutions and logistics.	Sometimes demonstrates effective decision-making and problem-solving.	Consistently demonstrates effective decision-making and problem-solving.	

Table 3. NACE-based Teamwork Assessment Tool (all dimensions used) [5]

Teamwork: Build and maintain collaborative relationships to work effectively toward common goals, while appreciating diverse viewpoints and shared responsibilities. N/O = Not Observed

Dimension	1 Emerging Knowledge	2 Understanding	3 Early Application	4 Advanced Application	N/O
Build Relationships for Collaboration	Recognizes that collaboration and relationship-building are important parts of team-building.	Understands how to build strong, positive work relationships for successful collaboration.	Sometimes builds strong, positive work relationships with colleagues for collaboration.	Consistently builds strong, positive work relationships with colleagues and supervisors for collaboration.	
Respect Diverse Perspectives	Recognizes the need to respect all people in the workplace, including those from diverse backgrounds.	Understands how to respect all people in the workplace, including those from diverse backgrounds.	Sometimes shows respect for and includes all people in the workplace, including those from diverse backgrounds.	Consistently shows respect for and includes all people in the workplace, including those from diverse backgrounds.	
Integrate Strengths	Recognizes their own and their colleagues' strengths, knowledge, and talents.	Understands how their own and their colleagues' strengths, knowledge, and talents can be integrated into the team to improve team performance.	Sometimes integrates their own and their colleagues' strengths, knowledge, and talents into the team's performance.	Consistently integrates their own and their colleagues' strengths, knowledge, and talents into the team's performance.	

Table 4. NACE-based Professionalism Assessment Tool (chose one of three dimensions) [5]

Professionalism: Knowing work environments differ greatly, understand and demonstrate effective work habits, and act in the interest of the larger community and workplace. N/O = Not Observed

Dimension	1 Emerging Knowledge	2 Understanding	3 Early Application	4 Advanced Application	N/O
Achieve Goals	Recognizes the need to focus on achieving goals in the workplace.	Understands how to focus on achieving goals in the workplace by prioritizing tasks.	Sometimes achieves goals in the workplace by prioritizing and completing tasks.	Consistently achieves goals in the workplace by prioritizing and completing tasks.	

Student Badging and Registration

The University of Denver (DU) Registrar's office already has a system to establish the badges and have students register for documenting their skill sets or micro-credentials. The current system uses Credly [8, 9]. Credly is a digital credentialing platform that issues, manages, and shares verifiable digital badges (micro-credentials) for skills and achievements, allowing individuals to showcase verified competencies on resumes, social media, and professional profiles. Students store badges in a digital wallet, which connects to a profile that highlights

skills, making it easier to link their skills to those skills requested in the job market. The University of Denver allows Deans and Associate Deans to create and approve badges through a vetting process to ensure that no comparable badges already exist on campus. The Ritchie School of Engineering and Computer Science (RSECS) along with campus Career and Professional Development are creating the “Career Passport” as an overarching umbrella to store various professional skills as badges. As an initial pilot program, the first four badge categories of the “Career Passport” are “Teamwork”, “Communication”, “Critical Thinking/Problem Solving”, and “Time Management”.

Each dimension of these badges will be stackable meaning that they will have the ability to attain three levels of achievement as already prescribed in the University of Denver badge system. The levels of achievement are described as the following: “Foundational”, “Intermediate” and “Advanced”. “Foundational” will be for attaining level 1 and 2 in the NACE Competency Assessment Tool; “Intermediate” will be for attaining level 3 in the NACE Competency Assessment Tool; “Advanced” will be for attaining level 4 in the NACE Competency Assessment Tool. Example badges are shown below for “Communication” in Figure 2 and 3. Achieving the “Advanced” level for both “Oral Communication” and “Written Communication” earns a “Communication Mastery” badge. Other badges follow a similar format for the first four competencies piloted.



Figure 2. Example of three stackable badge for the dimension of “Oral Communication”.



Figure 3. Example for Communication: Achieving the Advanced Level for both Oral and Written Communication earns a “Communication Mastery” Badge.

In the next section, we discuss how we expect students to achieve these badges through curricular and co-curricular activities.

Curricular and Co-Curricular Activities for Earning Badges

Simultaneously while launching the “Career Passport”, a series of 1-credit hour courses has been implemented for students to obtain levels of competency in professional skills in the curriculum. One of these courses is offered each year and are named “Career Readiness I – IV”. The “Career Readiness” sequence builds students’ interpersonal and professional skills with a focus on teamwork, communication, emotional intelligence, mentoring relationships, and internship preparation. Through applied activities, practice-based workshops, and real-world scenarios, students strengthen the competencies that help them succeed in diverse teams and professional environments.

By completing “Career Readiness I” students have foundational competencies necessary for career literacy, focusing on self-awareness, goal setting, and understanding the core mindset and habits required for success in engineering education and professional growth. At the end of this course, students will be able to: articulate personal strengths, values, and career goals, demonstrate professional competencies including time management, networking, and self-reflection; create an individualized career development plan aligned with interests and industry expectations, and identify and pursue relevant experiences (on-campus roles, internships, research, community work). Successful students, through this curriculum, would likely be able to attain “Foundational” competency in “Time Management”.

By completing “Career Readiness II” students will be able to: demonstrate effective teamwork skills including collaboration, role clarity, and shared responsibility, apply communication strategies that enhance clarity, confidence, and professional presence, use emotional intelligence and active listening techniques to give and receive feedback constructively, build mentoring relationships and articulate expectations for both mentor and mentee roles, prepare for internships by assembling a professional portfolio, conducting informational interviews, and developing an internship search strategy, and practice entry-level interview skills and communicate a personal brand through storytelling. Successful students, through this curriculum, would likely be able to attain “Foundational” competencies in “Teamwork” and “Communication”.

“Career Readiness III” prepares students to navigate the complexities of professional environments by strengthening critical thinking, professionalism, ethical decision-making, and responsible use of emerging technologies—including AI. Students will engage with real, ambiguous workplace scenarios, analyze ethical dilemmas, practice intermediate interview skills, and learn to apply professional norms that enhance credibility and effectiveness. This course emphasizes problem-solving, professional judgment, and strategic communication to help students stand out in competitive internship and job markets. A lot of the competencies are gained through experiential learning that is simulated in this course. Successful students, through

this curriculum, would likely be able to attain up to “Intermediate” competencies in “Teamwork”, “Communication”, “Critical Thinking” and “Time Management”.

“Career Readiness IV” is the culminating experience in the career readiness sequence. This course prepares graduating seniors to enter the professional world with confidence by deepening their leadership capacities, strengthening self-reflection skills, and enhancing their ability to navigate organizational culture, networking, interviewing, and career transitions. Students will analyze workplace norms, practice advanced interpersonal and communication skills, and learn strategies for evaluating job offers, negotiating effectively, and managing early-career growth. The overarching goal is to help students become thoughtful, value-aligned professionals and strong contributors in their first post-college roles. Successful students, through this curriculum, would likely be able to attain up to “Advanced” competencies in “Teamwork”, “Communication”, “Critical Thinking” and “Time Management”

At the end of each of these courses, the instructor of record for the “Career Readiness” courses will evaluate the student based on various artifacts relevant to each NACE competency. A Qualtrics [10] survey linked to the Canvas Learning Management System (LMS)[11] will be used to assess the NACE Competencies chosen for each course. The survey will be used to determine the NACE level of each competency which maps to the DU issued stackable badge levels, “Foundational”, “Intermediate” or “Advanced”. Likewise, as indicated in [4], three ABET-mapped competencies are relevant to our “Career Passport” competencies, thus, the students should also be evaluated where we currently collect assessment data for ABET for those competencies. Currently, our three-quarter Senior Design series is where we collect the assessment data, so we would also ask those instructors to provide feedback on the Qualtrics survey for the relevant competencies.

All the above-mentioned activities are curricular. However, the “Career Readiness” classes during the first two years are primarily preparing students to obtain internships or other experiential activities like undergraduate research or co-ops where they can practice their professional skills. We anticipate having a mechanism for our students to be evaluated by external observers from these internships on these competencies through the same Qualtrics surveys. For these surveys, we plan to work with our Career and Professional Development Office who can contact employers and administer the surveys and determine the competency levels for students in these co-curricular experiential learning activities. If students have multiple observers, both in curricular and co-curricular activities, and the results vary, ultimately, someone will have to assign the final assessment for the badge levels. We anticipate that one or two staff or faculty members will be designated to resolve the final badging levels. However, the hope is that much of the final badging will be automated.

Results

The methods for this work in progress have been described in the previous section. We anticipate implementing the above methods in a pilot program in spring quarter 2026. The assessment for

the chosen competencies will be performed on our graduating seniors in Senior Design focusing primarily on “Teamwork”, “Communication”, and “Critical Thinking”. In addition, one of our upper level “Career Readiness” courses will be offered and the competency assessments and implementation will be used in this course as well. We anticipate that we will have the initial results from this pilot and plan to discuss and present at the 2026 Annual ASEE conference.

Discussions

The university anticipates that a successful pilot will lead to RSECS and Career and Professional Development helping launch these career readiness competency assessments across other colleges as well in the academic year 2026/2027. In addition, incoming RSECS students will start completing “Career Readiness I-IV” as part of the new curriculum. Ultimately, that first cohort will be tracked longitudinally to evaluate the degree of professional readiness that implementing the “Career Passport” along with attending the “Career Readiness” classes provide by graduation. We ultimately will compare each year of students going forward to the cohort that has a full four years of prescribed professional skills preparation.

The engineering college plans to next launch methods for tracking competency assessments for engineering specific technical skills as part of the RSECS specific “Career Passport” in 2026/2027. In our strategic plan and in our literature review we found that there was an immediate need to provide competency assessment for engineering technical skills as well. In our meeting we labeled this competency as “Capable in the engineering profession”. In our next iteration of the “Career Passport” we plan to provide a system for RSECS students to obtain badges in these skills as well.

Conclusions

Based on a literature review on “what are the engineering competencies” and through strategic planning sessions on desired competencies in RSECS, we settled on four main competencies for the engineering school. The four competency areas that were established in the engineering college were the following: “Capability (Technical Skills in the Profession)”, “Coordination (Project Management and Teamwork)”, “Communication (Presenting and Writing)”, and “Critical Thinking”. Four of these skills more universally fit the career readiness competencies established by NACE. Our professional skills competencies mapped to the NACE general categories for competencies were the following: “Communication”, “Critical Thinking”, “Teamwork” and “Professionalism”.

Within these competencies we chose dimensions of each competency to map to our specific assessment needs. These competencies will then be assessed by various types of observers in curricular and co-curricular activities. The observers will use the NACE competency assessment tool, and the observer results will be collected through Qualtrics Surveys and the Canvas LMS enabling the students to earn badges at the “Foundational”, “Intermediate”, and “Advanced” level in each dimension of the competency. Students earning “Advanced” level in all the

dimensions evaluated in the competency area will earn a “Mastery” level badge. Collections of these competencies will earn the students badges that they can highlight in the “Career Passport” which will be hosted by Credly. Students could then provide future employers with these badges as evidence of professional skills attainment. The first implementation of this competency assessment tool will occur in spring quarter 2026 and the initial data will be presented at 2026 ASEE Annual Conference.

These universal career readiness competencies will be implemented campus-wide for all majors in coming years. At the same time, RSECS will then focus on creating assessment tools for RSECS specific technical skills that literature reviews have indicated are important competencies enhancing the “Career Passport” utility for both students and employers.

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