

Work in Progress: Integrating Site Visits into A One-Credit Civil Engineering Course to Advance Professionalism and Career Readiness

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1. INTRODUCTION

Professionalism and workplace readiness have become increasingly central to civil engineering (CE) education as programs respond to evolving industry expectations and rapid technology shifts, and heightened scrutiny regarding the return on investment of an engineering degree. Both the American Society of Civil Engineers (ASCE) Civil Engineering Body of Knowledge (CEBOK) [1] and the National Association of Colleges and Employers (NACE) Career Readiness Competencies [2] emphasize that graduates must demonstrate not only technical competence but also strong communication, leadership, ethical judgment, teamwork, and project management abilities. As a result, CE curricula are seeking more intentional ways to expose students to realistic workplace practices and provide diverse career options spanning consulting, public agencies, construction management, and emerging infrastructure sectors.

A wide range of experiential-learning models already support these goals, though each presents distinct limitations. Internships and cooperative education (co-op) programs provide deep immersion in professional environments but often require students to pause full-time coursework, which may complicate financial aid, visa status, or time-to-degree [3–8]. Senior-level seminars and capstone projects engage students with authentic constraints and stakeholder communication, yet they typically occur late in the program, restricting opportunities for earlier professional development. Co-curricular participation, such as involvement in student clubs, competitions, or undergraduate research, strengthens students' sense of identity and professional networks but is usually voluntary and minimally credited [9-10]. These variations in timing, structure, and accessibility highlight a need for earlier, guided, credit-bearing experiences that connect classroom learning to real-world practice while preserving academic continuity.

Site visits represent one such practice-integrated learning opportunity with growing evidence of educational impact. Prior studies in construction engineering education showed that in-person, guided site visits enhance students' understanding of theory-to-practice connections and strengthen motivation to pursue careers in the field [11- 15]. However, in these courses, site visits were included only as supplemental activities within existing construction engineering and management classes, to enhance those courses rather than serving as an independent instructional model. No prior work offered a dedicated, credit-bearing course built entirely around site visits, leaving a clear gap in the civil engineering curriculum.

This paper introduces a work-in-progress effort to design and implement a pilot, one-credit industry site-visit course aimed at advancing workplace readiness and professionalism among undergraduate CE students. This study is guided by experiential learning theory and professional identity formation as complementary lenses for examining how structured industry site visits contribute to students' professional development. The course integrates an orientation, multiple guided site visits facilitated through alumni and industry partnerships, and asynchronous preparation and reflection activities delivered via a Blackboard learning management system (LMS). By reframing site visits as a structured, assessed learning experience, this pilot offers a model that aligns with competencies prioritized by ASCE CEBOK and NACE including communication and professionalism, while maintaining academic momentum for all students. The course structure, logistics, assessment approach, and initial student outcomes are presented to inform broader adoption across the College of Engineering.

2. METHODOLOGY

2.1. Theoretical Framework

This paper is guided by Experiential Learning Theory (ELT) [16] and Professional Identity Formation (PIF) [17]. ELT [16] conceptualizes learning as a cyclical process involving concrete experience, reflective observation, abstract conceptualization, and active experimentation. Knowledge is constructed through the transformation of experience, rather than through passive transmission of information. In the context of this course, site visits provide concrete exposure to professional engineering environments, while pre-visit activities and post-visit reflections create structured opportunities for reflection and conceptual integration, supporting students' movement through the experiential learning cycle. PIF further extends this framework by focusing on how students develop a sense of themselves as engineers through authentic participation, social interaction, and reflection on professional and roles. Research in engineering education has demonstrated that experiential and practice-oriented learning experiences play a critical role in shaping students' engineering identity, influencing persistence, career decision-making, and sense of belonging in the profession [17-21]. Based on the PIF literature, identity development is understood as a socially situated process in which interactions with practicing professionals, role models, and communities of practice help students internalize disciplinary values, expectations, and professional behaviors.

Two research questions were developed for further continuing study, although not all research questions were addressed in this work-in-progress paper:

- RQ1 (Experiential Learning): How does participation in a structured, credit-bearing site visit course support students' experiential learning cycles related to civil engineering practice and career readiness?
- RQ2 (PIF): In what ways do repeated industry site visits and interactions with practicing engineers influence undergraduate civil engineering students' professional identity formation and perceived alignment with engineering career pathways?

2.2. Course Description

The pilot course, CE/ENVE 3995: Site Visit to Civil and Environmental Engineering Industry, was developed and offered as a 1-credit special topics course in Fall 2025. The course grading components include 60% participation in site visits, 20% pre-visit and post-visit reflection activities and career module, and 20% the final reflection. The learning objectives of this course are to (1) understand the facilities and practices of the target industries of the semester, and (2) gain understanding to find a workplace that aligns with students' strengths. Objective 1 is assessed with the pre-visit quiz and post-visit reflections, and Objective 2 is assessed with the career readiness module's assignment, and final reflections. This course was offered as an elective, and to encourage student enrollment, a promotional flyer was created and disseminated through departmental social media channels (LinkedIn, Facebook, and Instagram), posted on the department website, displayed on bulletin boards in major engineering buildings, and announced in other civil engineering courses.

The semester opened with an in-person orientation where students were introduced to course expectations, safety protocols, and professional communication guidelines while participating in team-based activities, collaboratively establishing safety rules, and completing a self-introduction to begin building peer connections.

Each site was introduced by pre-visit reading and quizzes. Detailed project information, safety notes, and logistical instructions were posted on Blackboard a couple of weeks before the

visit. Based on the reading material, the instructor created a set of short multiple-choice quiz, and the students should complete the quiz by the day before each visit to demonstrate adequate preparation. These requirements enabled students to arrive on site prepared to ask informed questions and observe operations with appropriate context.

Site visits formed the core experiential component of the course. Sites were selected in collaboration with the department's advisory board, industry partners, and senior Construction managers from the office of University Planning, Design and Construction [22] to represent a range of CE subdisciplines, including structural, transportation, and environmental engineering. The instructor accompanied all visits to ensure pedagogical coherence and safety, and to facilitate introductions between students and industry professionals.

After each visit, students completed an individual reflection addressing what they learned, aspects of the visit they found most meaningful, potential career alignment, conversations with engineers, and a photo documenting participation. Between visits, students completed a structured career readiness module covering NACE competencies, professional networking using LinkedIn [23], and workplace values alignment. Assignments included drafting a thank-you letter to an industry partner and sending a LinkedIn connection request to a professional contact.

The semester concluded with a comprehensive final reflection synthesizing technical and professional lessons, favorite site experiences, evolving career interests, and feedback on the course design. Sample pre-visit quizzes, the questionnaire of the post-visit reflection and final reflection, and the course schedule with the sites are provided in the appendices A and D.

3. PRELIMINARY RESULTS

3.1. Participation and Student Outcomes

In the first offering, five female and two male participants were enrolled representing a range of academic levels: one freshman, four sophomores, and two juniors. All students attended the initial orientation session and participated in the ice breaking activity, rule making activity, and sharing their interests and expectations. Attendance at site visits was strong, with full participation for the 3 visits and only one student absents from two visits due to minor scheduling conflicts. All students completed the career readiness modules and associated networking assignments. These activities demonstrated consistent engagement with the professional development components of the course. As a result, all students received an A grade.

3.2. Pre and Post Survey Results

To evaluate changes in professional awareness and self-efficacy, students completed pre- and post-course surveys. The pre survey was conducted during the first week of the semester, and the post survey was conducted at the end of the semester for comparison. All survey items are framed as self-assessments of observable behaviors rather than familiarity with terminology, to better align with competency-based assessment principles. The following three questions were adopted to compare the effectiveness of the course related to RQ1.

- Q1: You are familiar with field practices of civil and environmental engineering industries.
- Q2: You are familiar with NACE Career Readiness competencies.
- Q3: You know how to start job searching with your credential.

Responses were measured on a five-point Likert scale ranging from *Strongly Disagree* to *Strongly Agree*. Pre-course responses indicated limited familiarity with industry practices and career readiness frameworks. For Q1 (see Figure 1), seven students reported their familiarity with CEE field practices in the pre-survey, with responses ranging from *Strongly Disagree* to *Agree*. In

the post-survey, responses shifted noticeably toward more positive categories, with 57% of students selecting *Strongly Agree*. For Q2 shown in Figure 2, 57% of students disagreed with statements about their NACE competency awareness in the pre-survey. In contrast, 57% strongly agreed in the post-survey, indicating clear gains in competency awareness following the learning modules. For Q3, post-survey results showed that 100% of students agreed or strongly agreed that the course enhanced their career navigation skills as shown in Figure 3. Overall, the post-course survey data demonstrate a clear upward trend, with an increased proportion of students selecting *Agree* or *Strongly Agree* across all questions. Although the small sample size limits statistical analysis, the consistent positive trend across all survey items indicates that the course effectively supported professional development.

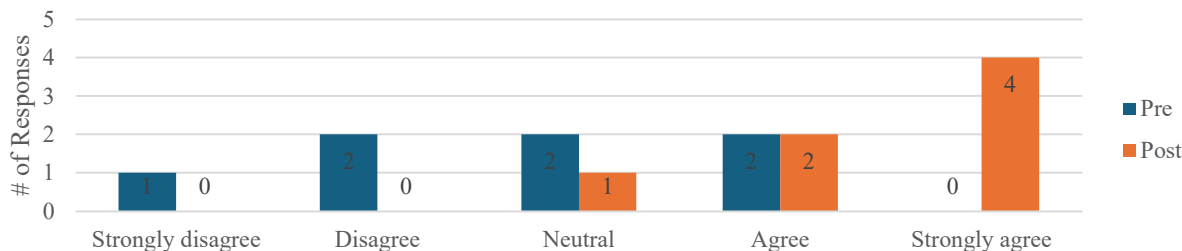


Figure 1. Responses to Q1 – Career practice awareness

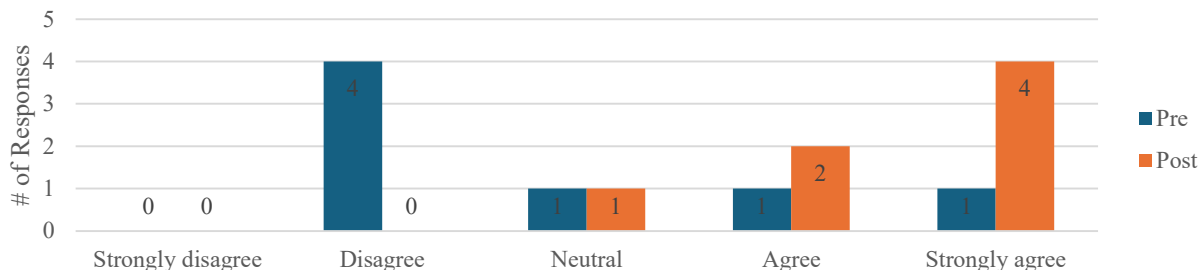


Figure 2. Responses to Q2 – NACE competency awareness

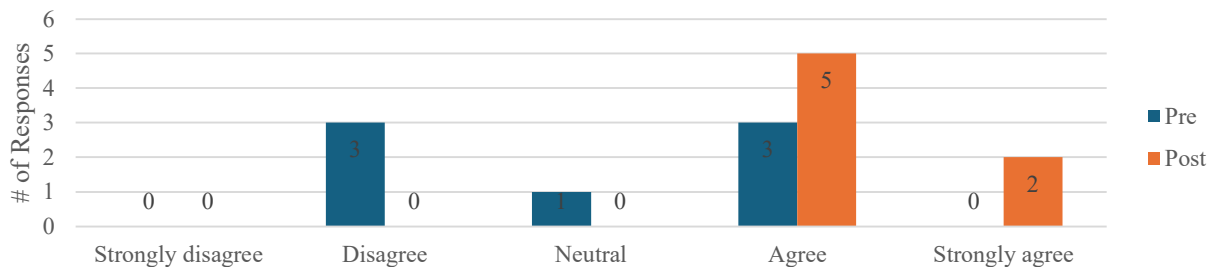


Figure 3. Responses to Q3 – Career navigation skill self competency

3.3. Final Reflection Responses

The initial final reflection questions were selected to align with both research questions. Question 1 was designed to elicit more personalized responses related to RQ1, while Questions 2–5 were used to assess RQ2. The full set of final reflection questions is provided in Appendix C.

The analysis of final reflections revealed clear themes illustrating the educational and professional impact of the course. Students' comments aligned closely with the course learning objectives and the broader aims of experiential learning in civil and environmental engineering. The following are summaries of the students' responses to the final reflection.

Learning and Application: Students consistently reported a deeper appreciation for teamwork, communication, (two NACE competencies) and the complexity of engineering practice. Many noted that seeing large projects firsthand helped them understand the extensive coordination among engineers, contractors, inspectors, and managers. One student observed that they “*never really understood how many people working together it takes for a project to finish,*” while another emphasized that “*engineers never work alone.*” Reflections showed that students gained insight into real-world problem solving, including how professionals balance safety, cost, and constructability, and how they manage disagreements respectfully. Students also commented on the variety of professional tasks across office and field settings, which clarified the day-to-day realities of engineering roles.

Career Interests and Goals: Many students reported that the course shaped or clarified their career interests. For some, the course confirmed a desire to pursue construction or transportation engineering. Others discovered new interests in environmental compliance or regulatory work. A few students shifted direction entirely, such as one who enrolled in a construction management minor and another who realized the construction sector was not a preferred path. Across reflections, students stressed the importance of developing communication and teamwork skills and recognized site visits as valuable preparation for internships and early career decisions.

Industry Interaction and Professional Identity: Direct interaction with engineers, project managers, and alumni was frequently described as the most impactful component. Students admired the leadership, confidence, and communication skills of young professionals. One student reflected on a project manager whose “*speech and presence were very commanding,*” identifying her as a model for future leadership aspirations. Others noted the importance of mentorship, perseverance, and professionalism, particularly for women and other underrepresented groups entering engineering.

Course Design and Effectiveness: Students commented positively regarding the course structure. Reflection assignments were repeatedly cited as the most effective mechanism for integrating learning, helping students process observations and articulate takeaways. Students valued the variety of visits across construction, infrastructure, research, and state agency settings, and emphasized that seeing projects in person created deeper understanding than classroom instruction alone. Pre-visit preparation further improved engagement by linking theory with practice.

Taken together, the final reflections indicate that this course can significantly enhance students’ understanding of engineering practice and career readiness, and contributed meaningfully to students’ professional identity formation and readiness for further experiential learning opportunities such as internships and others. Based on the initial results, the final reflection questionnaire will be further refined to better address RQ2 in a future semester

4. Lessons Learned

The pilot implementation of the site visit course provided several important insights regarding preparation, logistics, and assessment that will inform future iterations.

Faculty Role: The faculty coordinated all site visits and that required significant time and effort to establish contact with individual hosts and confirm availability. Having an existing network of alumni and industry partners proved invaluable in streamlining communication and securing access to diverse project sites. This underscores the importance of cultivating long-term relationships with practitioners and advisory board members to sustain experiential learning

opportunities. Furthermore, the instructor was responsible for schedules, transportation, managing liability waiver forms, and confirming on-site safety compliance, in addition to developing all course logistics, learning materials, and assessment tools. These efforts were essential to ensuring student safety and maintaining institutional standards. The instructor's presence during site visits was critical not only for oversight but also for maximizing educational value; through pre-visit briefings, the instructor guided structured question-and-answer frameworks and facilitated intentional conversations with industry professionals. During the visits, the instructor modeled effective professional communication and supported students in posing informed questions, reinforcing expectations of professionalism and enabling real-time mentoring and networking opportunities that students identified as highly impactful.

Future Work: While the preliminary pre- and post-course survey provided an initial indicator of changes in students' professional awareness, future iterations of this work will expand the assessment instruments to more rigorously measure competency development. Specifically, the authors plan to move beyond terminology recognition and self-reported familiarity by incorporating trait- and behavior-based survey items grounded in the ASCE Civil Engineering Body of Knowledge (CEBOK3) and NACE Career Readiness frameworks. For example, rather than asking whether students are familiar with NACE competencies, items will assess demonstrated capabilities such as students' ability to identify and ask targeted questions of supervisors and specialists, communicate within professional contexts, and navigate workplace expectations. This shift could strengthen alignment between learning objectives, instructional activities, and assessment, and enable more meaningful evaluation of how structured site visit experiences contribute to the development of professional competencies central to civil engineering education.

5. Conclusions

The pilot implementation of a one-credit, site-visit-based course demonstrated the effectiveness of integrating structured experiential learning into the civil and environmental engineering curriculum. Evidence from pre- and post-course surveys and final reflections indicated that the course enhanced students' familiarity with industry practices, increased awareness of NACE career readiness competencies, and strengthened confidence in initiating job searches. The combination of guided site visits, preparatory materials, and structured reflective assignments were bridging classroom instruction with real-world engineering practice. Collectively, these outcomes highlight the potential of site-visit-based courses as a scalable, credit-bearing approach to advancing workplace readiness and professionalism in engineering curriculum.

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Appendix A. Sample Pre-visit Activity 1: a Building Construction Site

1. What is the primary goal of the Whitney Road Steam improvement project?

- a. To construct additional classrooms
- b. To design a new dining facility
- c. To create new residence halls
- d. To replace a failed steam line and improve heating reliability.

2. Match the project components to its budgeted amount.

Design services
Construction
Project contingency
Insurance and legal

\$545,000
\$7,000,000
\$800,000
\$5,000
\$200,000

3. Match the areas that will benefit from the redundant steam supply to their respective names

South campus residence halls
New Connecticut Residence Hall and dining facility
Future school of nursing
Existing vault E-8

Buckley and Shippee Residence halls
Fine Arts Complex
South campus infrastructure
New proposed vault Q-8
North campus residence

Sample Pre-visit Activity 2: a Highway Construction Site

1. The CT Department of Transportation is responsible for
 - a. Construction of major transportation systems
 - b. Maintenance of major transportation systems
 - c. Planning of major transportation systems
 - d. Engineering of major transportation systems
 - e. All above

2. Which statement is correct, regarding the new exit numbering?
(the guiding website will be given in the final manuscript)
 - a. The new exit numbering is happening only for I-84, U-91, and I-395
 - b. The new exit numbering are determined based on the mileage in the CTDOT linear reference system.
 - c. The mileage typically runs from North to South, and West to East.
 - d. The exist number program is fully paid by Federal Funds

3. Which statement is incorrect regarding the 91/691/15 project?
 - a. This project site is located at the I-91, I-691, and Route 15 Interchange in Meriden, CT.
 - b. An innovative construction method, Geosynthetic Reinforced Soil, was used to build a new Integrated Bridge System to strengthen bridge strength, although it take slightly longer time for construction.
 - c. The total cost for construction and design is anticipated to be \$650 million.
 - d. This project includes construction of significant retaining walls to reduce environmental impacts and concrete pavement repairs.
 - e. The project will reduce traffic congestion and improve public safety.

Appendix B. Post-visit Reflection Questionnaire (Discussion Board Activity)

Reflect on your visit and share your thoughts with the classmates.

- What did you learn about the specific site we went to. What was your favorite part about the site visit, and why?
- Is this something you would want to pursue further? Is this the kind of place we could see ourselves working in the future? Is this something that interests you in the future? Why or why not?
- Was there anyone you met whose job you would like to have? What questions did you ask from the visit? Describe a conversation you had with someone at the site visit
- How could you use what you discussed in your future career?

And, please upload one photo to capture **the site and you**.

Appendix C. Final Reflection Assignment

Write your reflection (up to 500 words) in response to the questions below. You may use ChatGPT or other writing tools to help refine your writing; however, your initial responses must be your own work, based on your authentic experiences, observations, and personal reflection. Please indicate any use of AI at the end of the reflection. Delete all blue instructions before submission.

1. Learning and Application

Reflect on the most valuable technical or professional lessons you learned from the site visits. How did these experiences enhance your understanding of real-world civil and environmental engineering practices compared to what you've learned in the classroom?

2. Favorite Experience and Key Takeaway

Which site visit, project, or presentation stood out to you the most? Describe what made it memorable and how it shaped your view of the engineering profession.

3. Career Interests and Goals

How did this course influence the way you think about your future career? Did you discover a specific area of civil or environmental engineering you might want to explore further? Did you discover any new career paths or skills you want to develop further?

4. Expert and Industry Interaction

Identify one professional, engineer, or company representative who made a strong impression on you. What specific insight, advice, or example from their experience resonated with you—and why?

5. Course Design and Effectiveness

Reflect on how the structure and content of the site visit course supported your learning. What aspects were most effective in connecting theory to practice?

6. Suggestions for Course Improvement

What improvements or additions would make future site visits even more impactful?

Acknowledgements of use of AI

(e.g. I didn't use AI; I used ChatGPT for proofreading my first draft; I used Gemini multiple times to refine my writing; etc.)

Appendix D. List of Sites and Assignments

Table D.1. List of the Sites and Assignments – Fall 2025

Weeks	Date	Topics	Assignment and Due dates
1	8/29	▪ Introduction ▪ Course Planning	▪ Discussion Board Activity 0: Self introduction (due 9/4)
2	9/5	▪ Site Visit 1: South Campus and School of Nursing building	▪ Discussion Board Activity 1 (due 9/12)
3	9/12	▪ Site Visit 2: Mirror Lake and Whitney Road Steam improvements	▪ Discussion Board Activity 2 (due 9/19)
4-5	9/19	▪ Site Visit 3: Connecticut Department of Transportation	▪ Discussion Board Activity 3 (due 9/26)
6	10/3	▪ Site Visit Special: Moles Student Day Trip (optional - make up opportunity)	▪ Discussion Board Activity S (due 10/10)
7-8	10/3 – 10/17	▪ Preparing for the job market activity (Career Readiness)	▪ Becoming career ready ▪ LinkedIn module ▪ Finding a workplace that aligns with your values ▪ Assignment ▪ Career talk with experts
9-10	10/24	▪ Site Visit 4: Gant Phase 3	▪ Discussion Board Activity 4: Gant (due 10/31)
11-12	11/7	▪ Site Visit 5: Connecticut Transportation Institute	▪ Discussion Board Activity 5: CTI (due 11/14)
13	12/1	▪ Semester reflection and planning the next step	▪ Semester Reflection (due 12/1)