Work in Progress: Understanding faculty perceptions of a new construction engineering major

Jeffery M. Plumblee, Rebekah D. Burke, Mostafa Batouli, William J. Davis
The Citadel/ The Citadel/ The Citadel/ The Citadel

Abstract

Construction engineering and civil engineering are complementary fields, yet there are distinctions between the two fields that can be overlooked or misunderstood within academia. As the authors' institution initiated a construction engineering major, there was interest and concern as to how the construction engineering program would be marketed to students and differentiated with an existing civil engineering major, as well as ensuring the development of appropriate content. This paper provides the approach used to explore how engineering faculty at the institution defined construction engineering, collect their perceptions of what coursework and subjects should be included in a construction engineering program, understand how they distinguish between the fields of construction engineering and civil engineering, and gather their perceptions on which students should enroll in construction engineering. The information will be analyzed and compared with the ABET learning outcomes for construction engineering.

Keywords

Construction engineering, civil engineering, program development, faculty perceptions

Historical Context & Project Background

The fields of civil engineering and construction engineering have been integrally linked throughout history, and their development as academic disciplines are similarly intertwined. Construction engineering's formalization as an academic discipline dates back to late 1934, at which time the Civil Engineering Division of the American Society for Engineering Education was established and a construction engineering committee was formed.[1] Though civil engineering has been a common undergraduate field of study since the early days of West Point,[2] construction engineering education has taken a variety of forms, including: civil engineering courses incorporating construction engineering; elective course in construction; construction specialization within civil engineering; and a standalone major in construction engineering.[1] Because of the close relationship between civil engineering and construction engineering, the distinctions between the two fields is at times blurred, even to academics immersed in the disciplines.

As a result of continued rapid growth in the Charleston, South Carolina area, construction industry employers have identified a shortage of, and need for, graduates prepared to enter the construction workforce as engineers. To help meet regional demand and expand the institutional expertise, The Citadel initiated a construction engineering major within the Department of Civil and Environmental Engineering.

Existing faculty and administrators began developing course outlines and selecting potential textbooks while interviews were underway to hire two new faculty members for the new major. It quickly became apparent that there were different opinions as to the content that should be included within the construction engineering major.

Research Study

To better understand faculty perceptions of the new construction engineering major, authors sought to develop a survey to administer to engineering faculty across multiple engineering departments. When changing majors, some students will opt to change from other engineering disciplines to the construction engineering major, so it was important for authors to determine how familiar the faculty advisors throughout the School of Engineering were with the construction engineering program and discipline. To identify trends in faculty responses based upon related industry and academic experience, the following demographic information was requested:

- Position
- Highest level of education obtained
- Home department
- Years of industry experience
- Years of academic experience
- Years of construction-related experience

The survey sought to determine knowledge and perceptions of four primary subjects:

1. *The definition of construction engineering*

We want to ensure that the faculty have an accurate understanding of not only how to define the field, but also what typical jobs within construction engineering entail. These topics also drive how the program may be marketed to students interested in the program. Survey participants were asked the following open-ended question: “Please define construction engineering as an academic discipline.”

2. *Coursework and subject matter that should be covered in the construction engineering major*

As part of the effort to understand faculty perceptions of the major, the survey asks faculty to circle which of the following subject matter should be included in the curriculum, as seen in Table 1. The faculty were not limited in the number of subjects that they could choose.

Table 1: Subjects for potential inclusion into the construction engineering program

Scheduling	Statics	Accounting
Foundation design	Dynamics	Communications
Cost Estimating	Mechanics of materials	Engineering management
Safety	Mechanical/ electrical/ plumbing design	Heavy industrial construction methods
Quality	Dewatering	Residential construction methods
Leadership	Thermodynamics	Commercial construction methods
Formwork design	Circuits	Transportation
Ethics	CAD	Hydraulics and hydrology
Land planning	Fluid mechanics	Water and wastewater
Business law	Construction equipment	Building information modeling
Specifications	Sustainability	Construction documents
Steel design	Statistics	Technical writing
Concrete design	Engineering economics	Project management
Contracts	Construction materials	Surveying/geomatics

3. Distinctions between civil engineering and construction engineering

Because the institution offers both civil engineering and construction engineering as undergraduate majors, it was critical that faculty who would be advising students be able to distinguish between the two majors for their advisees. In an open-ended question, faculty were directly asked to "distinguish between the academic disciplines of construction engineering and civil engineering."

4. Which qualities a student should possess to be advised to major in construction engineering

In addition to gaining insight into faculty perceptions of the field of construction engineering, it was also important to understand what would trigger a faculty member to encourage their advisee to explore construction engineering as a potential major. This information could drive enrollment to/from other engineering majors and has the potential to negatively impact retention if students are directed to a program that may not be the best fit for their career goals and strengths. Faculty were asked, "Under what circumstances would you suggest that a student you are advising enroll in construction engineering?"

Next Steps

Once the data is analyzed, the team will identify gaps in faculty knowledge of the discipline and major, and ensure that the faculty understanding aligns with the intent of the new major. If major gaps are identified, the team may make recommendations to administration regarding development of more detailed content describing the major and differentiating it from existing majors, particularly relevant for academic advisors.

The team will then combine this data with parallel studies to understand industry and student perceptions of construction engineering to gain a more holistic picture of stakeholder perspectives of construction engineering. Discrepancies between stakeholder perceptions will be explored with the intent of aligning all relevant stakeholders on the major's audience, intent, ABET requirements, and curriculum.

References

1 Ledbetter, Bonnie S. "Pioneering construction engineering education." Journal of Construction Engineering and Management 111.1 (1985): 41-51.
2 Schexnayder, Cliff J., and Richard Mayo. Construction management fundamentals. McGraw-Hill Professional, 2003.

Jeffery M. Plumblee, PhD, MBA, PMP

Jeffery Plumblee is an Assistant Professor in the Department of Engineering Leadership and Program Management at The Citadel. Plumblee's research interests focus on building a more resilient society. Plumblee has a passion for providing opportunities for students to work within and develop projects for resource constrained settings (primarily humanitarian technology and delivery), and he enjoys understanding how these activities uniquely develop students.

Rebekah D. Burke, PhD, PE

Dr. Burke is an Assistant Professor of Construction Engineering at The Citadel. Dr. Burke received her Doctoral degree from Arizona State University. She was previously the Director of Sustainable Design for Clark Nexsen, Architecture & Engineering, where she also began her career as a structural engineer. She was a founding board member, and the first chair elect of the Hampton Roads Green Building Council.

Mostafa Batouli, PhD, MPA

Mostafa Batouli is an Assistant Professor of Construction Engineering at the department of Civil and Environmental Engineering at The Citadel. Dr. Batouli received his PhD in Civil and Environmental Engineering from Florida International University. He also holds Master of Public Administration and Graduate Certificate in Homeland Security and Emergency Management from FIU, Master of Science in Civil Engineering/Construction Engineering and Management from IAU, and Bachelor of Science in Civil Engineering/Surveying from University of Tehran. Dr. Batouli's research interests include system-of-systems analysis of sustainability and resilience in civil infrastructure, as well as broad area of engineering education.

William J. Davis, PhD, PE

William J. Davis is a Professor of Civil & Environmental Engineering at The Citadel in Charleston, SC. His academic experience is focused on transportation infrastructure planning and design, infrastructure resilience, traffic operations, highway safety, and geographic information systems. His research interests include constructing spatial databases for better management of transportation infrastructure, improving transportation design, operation, safety and construction, understanding long-term effects of urban development patterns, and advancing active living within the built environment. He teaches courses in interchange design, engineering management, transportation engineering, highway design. geographic information systems, and land surveying. He has served in numerous leadership positions in TRB, ASCE and ITE.