

Editorial | *A Bold Vision: Educating Tomorrow's Leaders and Innovators*

By David J. Odeh, S.E., P.E., SECB, FSEI



What inspired you to become a structural engineer? For me, it was a fascination with the great buildings of history, like the Parthenon and the Eiffel Tower, and the ingenuity and creativity of the civilizations that built them. Starting with that early inspiration, I have always been driven by a desire to create new structures that have a positive impact on the way people live. Regardless of why we chose structural engineering as a career, it is this underlying passion that yields our most impactful ideas and accomplishments. If we want the future of our profession to be one of leadership and innovation, then we need to better harness this energy by changing the way we educate and train young structural engineers.

For the last fourteen years, I have taught a class in structural design for civil engineering students in their senior year of undergraduate study. Often, this class is the first glimpse these students get into the real world of professional practice. But while the practice of structural engineering has changed dramatically over the time I have taught this course, the way we prepare our students to enter the profession has been largely stuck in “neutral” for more than a generation.

Fundamentally the system is still based on an undergraduate degree in civil engineering, followed sometimes by a master's degree with more specialized technical coursework. Undergraduate degree programs are highly constrained by ABET, the organization that accredits most engineering programs, through prescriptive content requirements that must typically be met in a four-year program. These requirements allow minimal opportunity for students to explore areas outside of their chosen field. Most core courses are technical in nature and, with no formal internship or residency requirements, many young engineers become licensed to enter professional practice with limited practical experience or knowledge of disciplines outside of civil and structural engineering.

To judge the effectiveness of these programs, consider what skills will be rewarded by the economy of the future. Typical structural engineering tasks like stress analysis, prescriptive code-checking, member size selection, and detailing will be increasingly handled by automated computer programs or lower-cost technicians, perhaps working remotely. To truly lead and innovate, structural engineers must be decision-makers instead of technicians. They must be able to leverage the output of computer models to create innovative conceptual designs and new solutions to difficult problems, or create new paradigms that apply technology from many core fields like materials science, solid mechanics, machine design, mathematics, and physics. This will require a mastery of the classical methods, but also new skills that respond to the changing dynamics of professional practice.

To innovate, structural engineers must also learn to operate in a more collaborative and interdisciplinary manner. We will need to move beyond working alone on calculations and specifications in our offices, and contribute to a more holistic and integrated design and construction process. The industry is increasingly turning to newer and more collaborative approaches to construction such as “Integrated Project Delivery”, a contractual method in which designers, contractors, and owners align their goals and work in highly collaborative teams to tackle the complex problems presented by construction projects. On such teams, structural engineers might be “co-located” with architects, builders, and other engineers in rooms with high-tech displays of computer models where teams jointly develop design solutions.

Finally, to lead in the global economy, structural engineers must be able to operate in multiple languages and cultures, and have a broader understanding of different building systems in use throughout the world. In one of my firm's recent projects located in the United States, the entire steel detailing package was completed by a team operating out of the Philippines. While initially concerned about this arrangement, I was eventually impressed by the ability of these detailers to communicate with our engineers and efficiently understand and execute our design. American structural engineers must similarly adapt their unique skills to a broader worldwide marketplace if we hope to remain competitive in the global economy.

SEI is committed to addressing this challenge at its roots, and engaging in an effort to re-imagine the educational system to better align it with the vision for the future. Earlier this spring, the institute created the new “Committee for the Reform of Structural Engineering Education” (CROSEE) with a mission to engage with key stakeholders from both academia and the profession to create bold, new initiatives to transform structural engineering programs. CROSEE will focus on re-thinking undergraduate education, exploring the concept of new “professional schools” for structural engineers, creating new and more formalized models for engineering internship programs, and strengthening the links between academics and practice. Recognizing that change in academia is difficult and will face numerous obstacles, the committee intends to begin its work with workshop sessions designed to frame the key issues and identify both short-term and long-term goals for reform.

If you are passionate about structural engineering education and the future of our profession, consider some ways you can get involved in this initiative. Stakeholder workshops will be a great way to contribute your ideas and opinions. Agree or disagree, this is your chance to influence the future of our profession. Additionally, as a key strategic initiative of SEI, the SEI Futures Fund is investing in CROSEE by providing seed funding for its first stakeholder workshop. If you believe, like I do, that our educational system needs to evolve to a new model of leadership and innovation, please consider making a gift to the Futures Fund this year.

We can only imagine what the inspiring structures of tomorrow will be. Perhaps we will create buildings made from new materials that are better able to withstand natural disasters and improve public safety; conceive of new classes of structures that seamlessly blend with elements of mechanical systems to improve energy efficiency and reduce the impact of construction on the global climate; or invent more humble buildings that revolutionize the availability and affordability of housing for the world's growing population. To remain at the forefront of these advances, future structural engineers must be critical and creative thinkers fueled by a passion to solve the world's great challenges. Let's take action to reform our educational system today to build a vibrant and engaged profession for the future. ■



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