

Reforming Structural Engineering Education

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The Committee for the Reform of Structural Engineering Education (CROSEE) was instigated by the SEI Board of Governors to review, reimagine, and reignite Structural Engineering Education for the 21st Century, or at least the next 20 years!

The committee of practitioners and academics has deliberated on the nature and future of structural engineering, particularly as we see the passionate work done by researchers and standards writers to codify the practice of the profession almost to extinction in the era of AI/ML (Artificial Intelligence/ Machine Learning). While performance-based code approaches are opening the door to the real value of structural engineering, what is clear is that the profession, like many others, must be seen as a 4 (or 5) + 40-year continuum. Clearly what is taught (much), what is learned (less), and what is practical (?) should, therefore, inspire lifelong learning and that curiosity must be cultivated and developed in the most flexible minds – those of the young, and young-at-heart. For curiosity is the spring of eternal (lifelong) learning, and the source of inspiration and innovation, two characteristics seen publicly as more the domain of the architect rather than the structural engineer in the current context.

It is without a doubt that structural engineers bear substantial responsibility for life safety and property preservation, and that our first-world expectations lead to safe and often conservative designs. Public expectations for such ‘reliability,’ low risk, and high professional regard, are welcome but equally challenge the ability to innovate and perhaps recruit the most talented to the profession. Interestingly, computers and computational – modeling, analysis, fabrication, and construction management tools – now allow architects to create amazing structures, albeit with the seemingly silent partnership of the structural engineer. Better communication of the crucial role of the structural engineer in these creations will help maintain and grow the profession.

Examining the historical education of the structural engineer, we see a progression from the apprenticeship model of the master builder, wholly within the profession, to the current version in which the academy and the profession are almost wholly separated by the student body with limited overlap. While the academy rightly focusses on instilling fundamental skills of material performance, structural behavior, loading, modeling, and analysis, and the professional skills in students in design and project management, it is clear that there needs to be a blurring of the seemingly distinct boundaries seen by most parties in this education process. Academics often believe that this is the first and maybe last chance to instill a fundamental understanding of structural behavior, while for students it is often hard to see the relevance of material studied, trapped in the semester cocoon of homework

and quiz cycle. Professionals are apt to focus on the business end of the profession and the importance of application. Boundary blurring is increasingly achieved, at least in one direction – profession to academe, via adjunct professors (full or part-time) who bring much needed ‘real world’ examples to the students, often wallowing in analytical abstraction. One question CROSEE has been examining, and which was the subject of a panel discussion at SEI Congress in Orlando this year, is the training required, desired, or perhaps mandated for adjuncts. What motivates professional experts in the field to ‘profess’ and teach the next generation of engineers? What impediments or inducements arise or obstruct? How best to convey this knowledge in the more formal classroom setting to a new generation of students driven by and interested in technology?



On the other hand, as the academy focusses more on scientific rather than engineering endeavors, often driven by research funding availability, the challenge is how to make the formal engineering education better relate to engineering practice and also how to engage students in the wonders of modern engineering. This is particularly the case when many university faculty no longer ‘practice’ engineering, hold licensure or have even worked in the industry, having transitioned from one education arena to another. Perhaps academics need to be challenged with sabbaticals in industry to develop relationships that lead to collaborations and research opportunities on real problems of interest to the profession, and hopefully to the betterment of society as a whole rather than the individual. Indeed, civil engineering, of which structural engineering is a significant component, is about creating *common wealth*, the infrastructure that supports our integrated, complex, urban existence.

By promoting a porous boundary between the profession and the academy, one that sees experienced adjuncts teaching and junior faculty embedding in Industry, it is hard to see how students would not benefit as those ‘in the middle.’ Additionally, the vigor of modern engineering practice, challenged by the amazing structures now conceived, can only help attract students to our profession.

Please follow CROSEE here and at future SEI Structures Congresses as we continue to promote structural engineering approaches and initiatives to fulfill the Board of Governors charge. Join the discussion at <https://bit.ly/2V9c5n4>.



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