

## Studies at the Interface: Engineering Education Research and Engineering Education Innovation

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Currently there is enormous emphasis on innovation in engineering education and in STEM education in general as indicated, for example, by the change at NSF DUE from CCLI to TUES, the National Academy of Engineering Frontiers of Engineering Education Symposium, and the appointment of Carl Wieman as Associate Director of the Office of Science and Technology Policy. This seminar provides a personal perspective from the speaker who started his career as a materials processing engineering researcher, struggled to find better ways to help engineering students learn, embraced cooperative learning as an education innovation, and along the way became an engineering education researcher who has been deeply involved with the emergence of engineering education as a field of research.

Questions considered are (1) how to we foster engineering education innovation, and (2) what role does engineering education research (EER) play in innovation. The EER community is growing rapidly through the emergence of PhD granting programs in the US (Purdue, Virginia Tech, Utah State, Clemson, Carnegie Mellon, and Arizona State) and Europe, India, Malaysia, and Mexico. Also, several universities have established Centers that emphasize engineering education research, including the University of Washington, Colorado School of Mines, Ohio State University, Washington State University, Michigan State University, and others. A key challenge will be keeping the research tightly coupled with engineering education practice.



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Karl has been actively involved in engineering education research and practice for over forty years. He is in phased retirement as Morse–Alumni Distinguished Teaching Professor and Professor of Civil Engineering at the University of Minnesota and is Cooperative Learning Professor of Engineering Education, School of Engineering Education, at Purdue University West Lafayette, where he is helping start the engineering education PhD program. His research and development interests include building rigorous research capabilities in engineering education; the role of cooperation in learning and design; problem formulation, modeling, and knowledge engineering; and project and knowledge management. He is a Fellow of the American Society for Engineering Education and past Chair of the Educational Research and Methods Division. He has served as PI and Co–PI on several NSF funded projects including two NSF Centers for Learning and Teaching (CLT). He was Co–PI on an NSF CCLI National Dissemination grant entitled "Rigorous Research in Engineering Education: Creating a Community of Practice" and is currently Co-PI on an NSF CCLI Phase III project, "Expanding and sustaining research capacity in engineering and technology education: Building on successful programs for faculty and graduate students." Karl has worked with thousands of faculty all over the world on pedagogies of engagement, especially cooperative learning, problem-based learning, and constructive controversy. He has authored or co-authored eight books including *How to Model It: Problem Solving for the Computer Age*, *Active Learning: Cooperation in the College Classroom*, 3<sup>rd</sup> Ed., *Cooperative learning: Increasing college faculty instructional productivity*; *Strategies for energizing large classes: From small groups to learning communities*; and *Teamwork and project management*, 3<sup>rd</sup> Ed. His Bachelor's and Master's degrees are in Metallurgical Engineering from Michigan Technological University and he holds a Ph.D. in Educational Psychology from the University of Minnesota.