From theory to application and back again: *The interplay between research in higher education and engineering education*

Jenni Case, Virginia Tech & University of Cape Town
Mike Klassen, University of Toronto
David Knight, Virginia Tech
Xiaofeng “Denver” Tang, Tsinghua University
Nicky Wolmarans, University of Cape Town

- Discipline-Based Education Research (DBER)
  - Tremendous growth in past few decades; assumption typically that main audience are practitioners in the discipline
  - Engineering Education Research (EER) is a DBER type field, active debates on the nature of the field, who participates, what theory and methods are drawn on….
- This panel
  - Four EER researchers who use broad questions and theories from higher education and bring these to bear on a range of key issues in engineering education.
  - Brief summaries of key findings from one recent paper - to build the overall conversation:

What value or interest might be offered by engaging with the findings of discipline-based education research for the broader higher education research community?

Nicky Wolmarans, University of Cape Town

Wolmarans, N. (2018). Knowledge structures in engineering design: integrating multiple ‘ways of knowing’. 2018: Proceedings of the Canadian Engineering Education Association (CEEA) Conference June 3-6, 2018 Vancouver BC

- Knowledge matters: Balancing workplace readiness and the power of knowledge.
- Engineering as a case study
  - Engineering has always been about preparation for the workplace (Region)
  - Engineering education has aligned with the sciences (siloed disciplinarity)
- Key argument: Education cannot and should not attempt to replicate the workplace
  - The measure of success is necessarily different - result v demonstration
  - Problems/tasks originate differently - contextual v conceptual complexity
  - Knowledge takes a different form - learning to translate

Translate knowledge out of academia & into practice, or strip knowledge of its power.

David Knight, Virginia Tech

Grote, D. M., Knight, D. B., Lee, W. C., & Watford, B. A. (2020). Exploring influences of policy collisions on transfer student access: Perspectives from street-level bureaucrats. *Educational Evaluation and Policy Analysis, 42*(4), 576-602.

- Many states and institutions rely on articulation agreements to support vertical transfer to help students move from a community college to a four-year university
- In this paper, we consider how articulation agreements play out on the ground and dig into why what appears to work well on paper, doesn't always work in practice
- Focused our analysis on faculty and academic advisors and frame using the lens of street-level bureaucracy with respect to policy implementation
- We identified collisions between the articulation agreement and an enrollment management policy where transfer students and advisors can become stuck in the middle, which can lead to frustration, increased time to degrees, and variability across students and advisors

Mike Klassen, University of Toronto

Klassen, M., & Sá, C. (2020). Do global norms matter? The new logics of engineering accreditation in Canadian universities. *Higher Education*, *79*(1), 159–174.

- Multiple case study of changing accreditation requirements and their influence on organizational structures/processes in 3 Canadian engineering schools
- Engineering (high mobility, international agreements) shows isomorphism of quality assurance via ‘global regimes’ (Zapp & Ramirez, 2019)
- Institutional pressures for professional schools to conform to global norms, yet substantial variation in response at different universities
- By looking in depth at one professional field we see differences in epistemic/curriculum governance across disciplines - painting a differentiated picture of ‘small worlds, different worlds’ (Clark 1987)

Xiaofeng “Denver” Tang, Tsinghua University

Cao, Y., & Ma, X., & Case, J. M., & Jesiek, B. K., & Knight, D. B., & Oakes, W. C., & Paretti, M. C., & Tang, X., & Xie, Z., & Zhao, H. (2021, July), *Visions of Engineers for the Future: A Comparison of American and Chinese Policy Discourses on Engineering Education Innovation* Paper presented at 2021 ASEE Virtual Annual Conference

- “**The global dimension of higher education … is formed by acts of imagining**” (Marginson, 2011).
- This paper compares visions of “engineers for the future” embodied in Chinese and American policy texts.
- Based on similar assessment of the structural forces that shape engineering education (technical knowledge, employers’ demand, and aspirations of the engineering profession), the discourses of engineering education policy in China and the US become sites where technological, economic, and social imaginaries intersect.
- The dominant imaginaries of the global landscape of engineering education embraced in China and the US (i.e., tiers of engineering education excellence vs. leader-challenger) are reflective of historically inspired ways of making sense of the global order (dating back to Sputnik and so on).

Starting the conversation...

(a VERY brief comment by each panellist on the other studies)

Acknowledgements to our institutions and funders

This research was funded under a National Research Foundation Thuthuka PhD track grant

This material is based upon work supported by the National Science Foundation Engineering Education and Centers under Grant Number DUE-1644138. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.