

SYMPOSIUM ON THE SCIENCE OF LEARNING
Competence and Expertise:
Are we expecting enough from our students and residents?
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Introduction (Richard M. Schwarzstein, MD)

Expertise = knowledge + experience. There's a difference between a routine expert and an adaptive expert. How do we create the latter?

- **K. Anders Ericsson, PhD, Professor of Psychology, Florida State University**
"Improving Outcomes with Purposeful and Deliberate Practice"

There's a qualitatively important difference between routine practice time and controlled practice time. Gladstone's magic number of 10,000 hours of practice is meaningless if there is teacher to guide the learner during the accumulation of those hours.

Highly successful practitioners review their cases carefully and fully every day, analyzing in retrospect the actions taken and drawing conclusions that can be helpful for future situations. Top experts spend 4-5 hours daily of effortful practice, externalizing their thinking.

How can such practitioners help train the next generation? Develop training resources, instruction, and support.

- Make videos that can be analyzed.
- Give immediate feedback after students/residents perform an exercise/simulated case.
- Incorporate competition into the exercise.
- Include adversarial interruption during simulated cases so that students/residents get practice in staying focused.

- **Maria Mylopoulos, PhD, Assistant Professor of Pediatrics, University of Toronto**
"Developing the Experts We Need: Cognition, Context, and Competence"

Adaptive experts purposefully learn through problem-solving, moving from the procedural (what to do) to the conceptual (why one is doing it). To be optimally adaptive, one needs a combination of efficiency and innovation.

The difference between a true expert and an experienced non-expert is that the former integrates knowledge and patient stories.

In medical education, integrated instruction is crucial: the learner has to cultivate cognitive activity happening within, developing the practice of representation.

Emphasize struggle and risk-taking in educational approaches. Create a time for telling that you then fill with direct instruction, instead of providing the direct instruction first. Another fruitful approach, even if students don't enjoy it, is an exercise that is bound to fail—but it is a productive failure insofar as there is much learning to take from it.

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