

Student Learning in Challenge-based And Traditional Instruction in Biomedical Engineering

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Overview

- Adaptive Expertise (AE)
- Measuring Innovation and Efficiency
- Results from Biotransport
- Conclusions

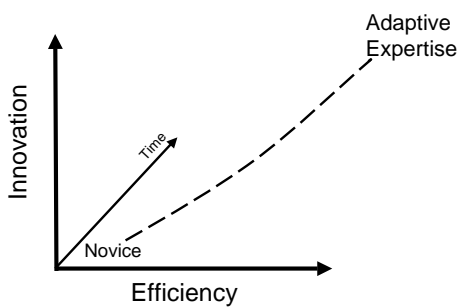
Adaptive Expertise



Educational Research

- Research has supported this picture
- Educational question is how do we help students develop AE

Developmental Model for AE



HPL Instructional Principles



John Bransford, et al. (1999) *How People Learn*. National Academy Press.

Research Goals

- Measure innovation and efficiency
- Compare in HPL and traditional instruction for a biotransport course in BME

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Design and Measures

- Biotransport courses: HPL and Traditional
- Pretest and Posttest
 - Knowledge problems
 - Multiple Choice
 - Correct or Incorrect
 - Generate Ideas problem: *The Danger of Hot Coffee Burns*
 - "How dangerous is it to spill a cup of hot coffee into your lap?"
 - Innovation
 - Efficiency

Predictions

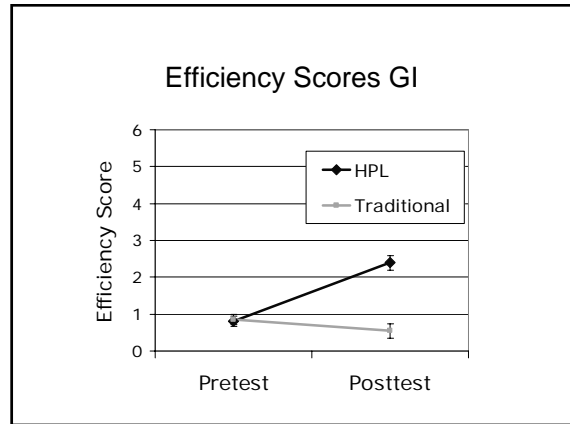
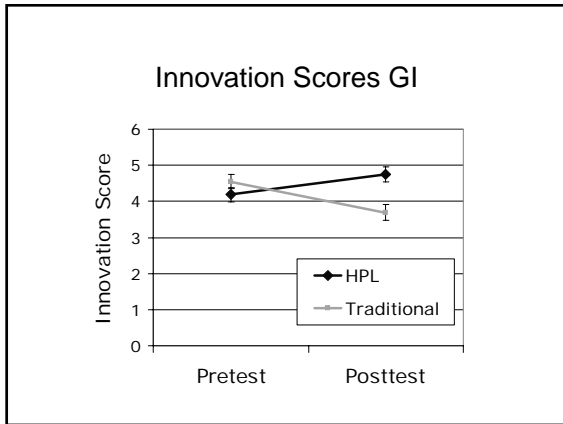
- Expected similar performance on multiple choice factual knowledge questions
- Expected HPL students to outperform Traditional students on Generate Ideas problem

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Knowledge scores

- All students improved
 - Pretest $M = 3.08$, $SE = .11$
 - Posttest $M = 3.53$, $SE = .10$



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- ### Conclusions
- Results
 - Similar knowledge growth
 - Significant added value for innovation skills
 - HPL framework
 - More effective
 - Better suited to undergraduate engineering students developing AE skills

- ### Implications
- Innovation skills will help students in future professional endeavors
 - ABET guidelines call for more innovative engineers
 - Notable that experiment in a regular class setting