EPICENTER

research summit

AUGUST 4-5, 2014 • STANFORD UNIVERSITY

Embedded Model

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NSF

Stanford
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NCIIA

Entrepreneurial Curriculum - The Challenge

Are we doing enough to help engineering students succeed in the working world?

- 3 out of 4 engineering graduates are employed by "private industry or business."[1]

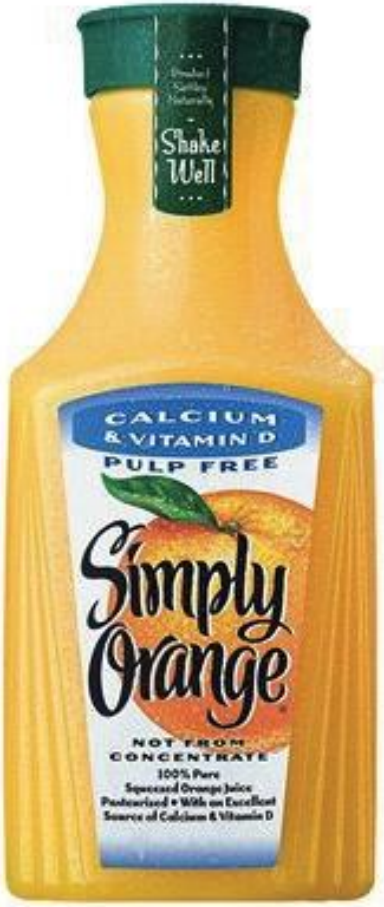
National Center for Education Statistics[2] 2010-11:

- **76K** – undergraduate engineering degrees
- **364K** – undergraduate business degrees
- **187K** – graduate business degrees (MBA)
- **Roughly 20%** of MBA's are engineering undergraduates which means **about ½ of all undergraduate engineers return for an MBA**

1. National Survey of Recent College Graduates. US National Science Foundation (NSF); 2008 Oct p. Table 41– 42. Report No.: NSF 12-328.
2. Table 317. Bachelor's, master's, and doctor's degrees conferred by degree-granting institutions, by sex of student and discipline division: 2010-11. Digest of Education Statistics, 2012. Available from: http://nces.ed.gov/programs/digest/d12/tables/dt12_317.asp

Entrepreneurial Curriculum - Overstuffed

Entrepreneurial Curriculum - Embedded Model

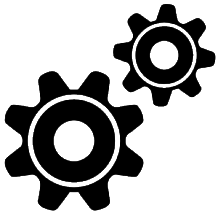
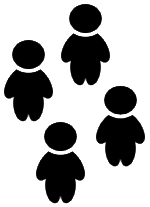


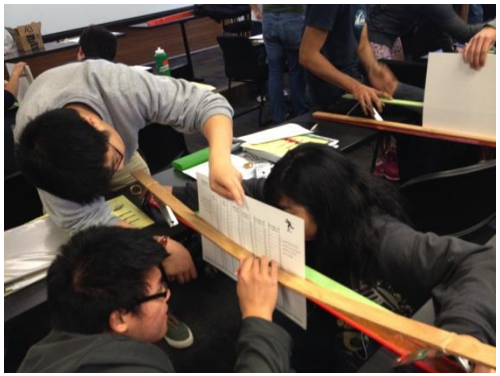
Entrepreneurial Curriculum – eSBL Scenario-Based Learning

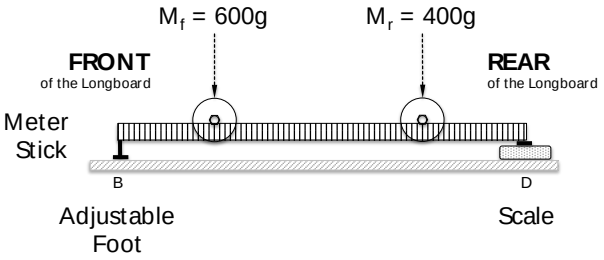
	Madison Longboard 1: Choosing a Truck	**Madison Longboard 2:** Designing a Deck	**Trek Bicycle Corporation:** B-cycle Drive Train
Engineering Content	Free-body diagrams Normal Force Equilibrium Analysis Moments Moment Center Planar Systems	Modulus of elasticity Deflection Neutral Axis Cantilever beam Bending stress Design for deflection	Mechanical Advantage Output Load/Input Load Gears Speed Ratio Multiple FBD's
Entrepreneurial Content	Business model Value proposition Revenue model Cost model Profit model	Vision statement Mission statement SWOT analysis Business risk Business uncertainty	Personas Empathy map Product planning Interpersonal relationships Vendor relations
Lab	Moveable weights, meter sticks, jeweler's scale	Material samples, angle brackets, tube scale	Bicycle, blue tape, paint stir stick, tube scales

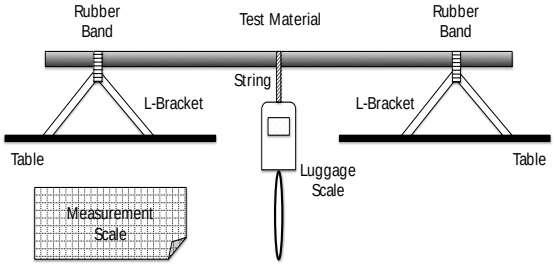
Starting Point: Entry-Level Mechanical Engineering (Statics)

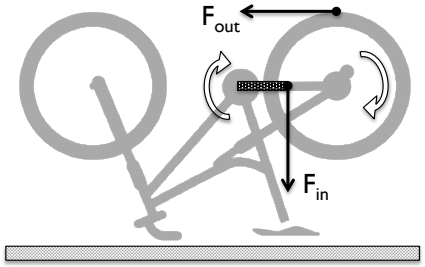
Entrepreneurial Curriculum – eSBL
Scenario-Based Learning

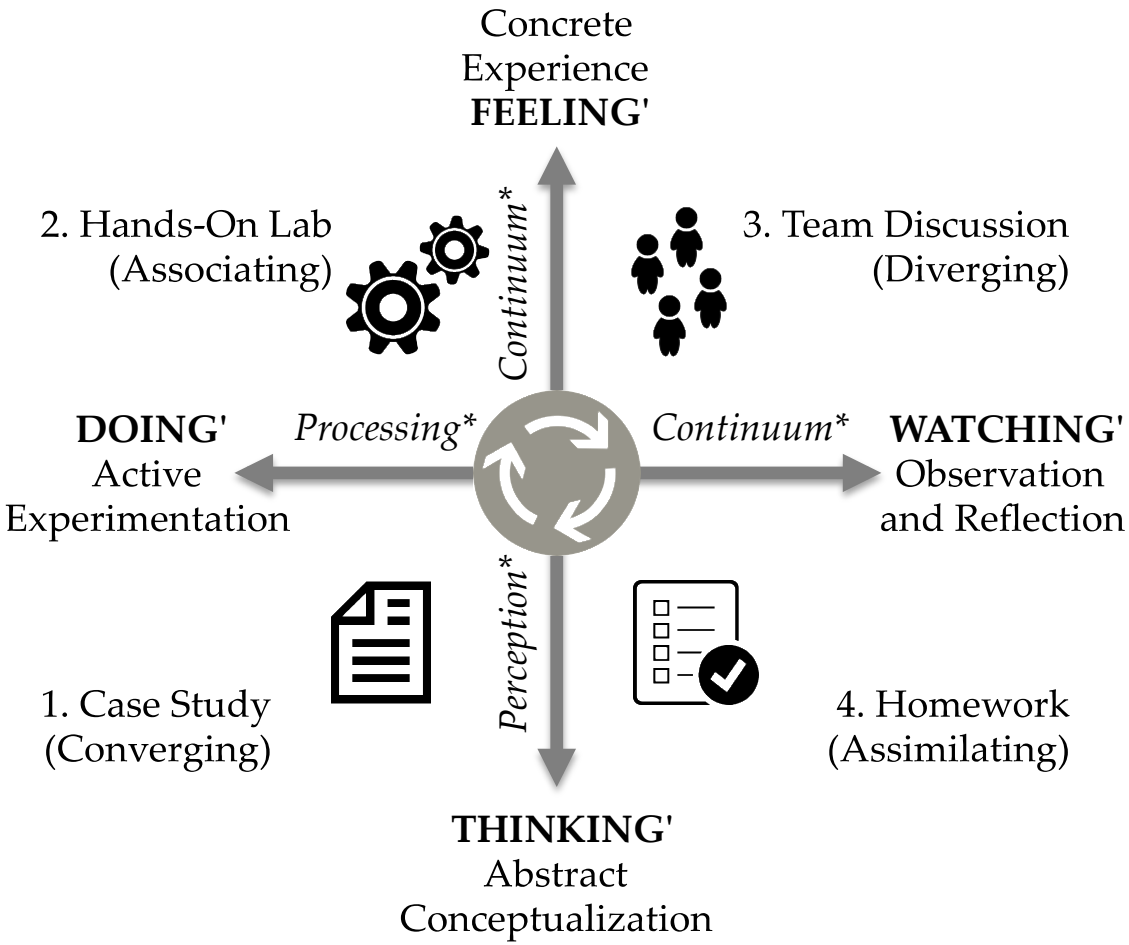



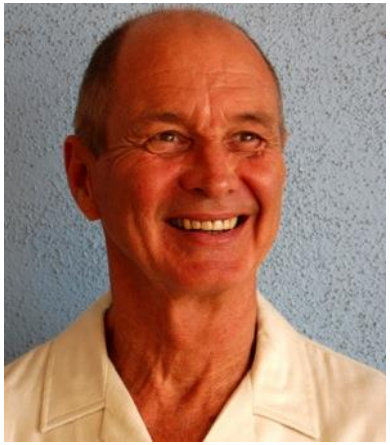







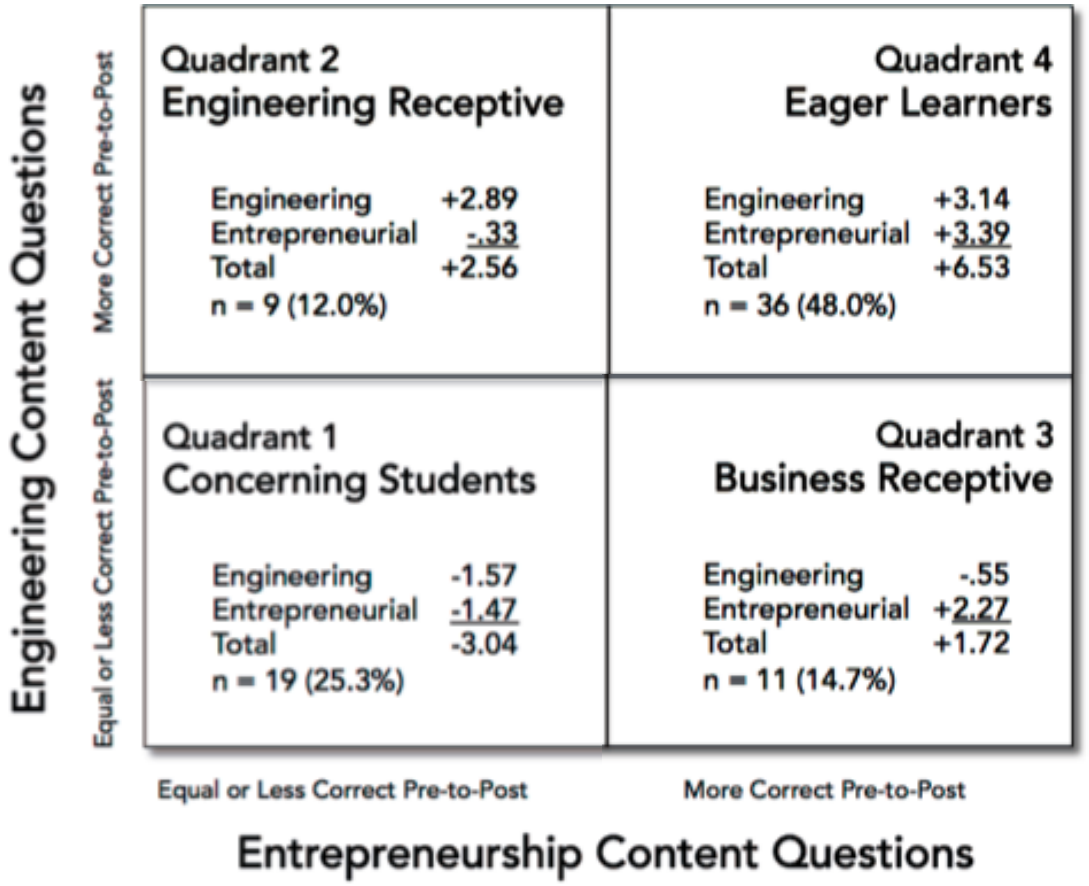
Entrepreneurial Curriculum – eSBL Learning Theory



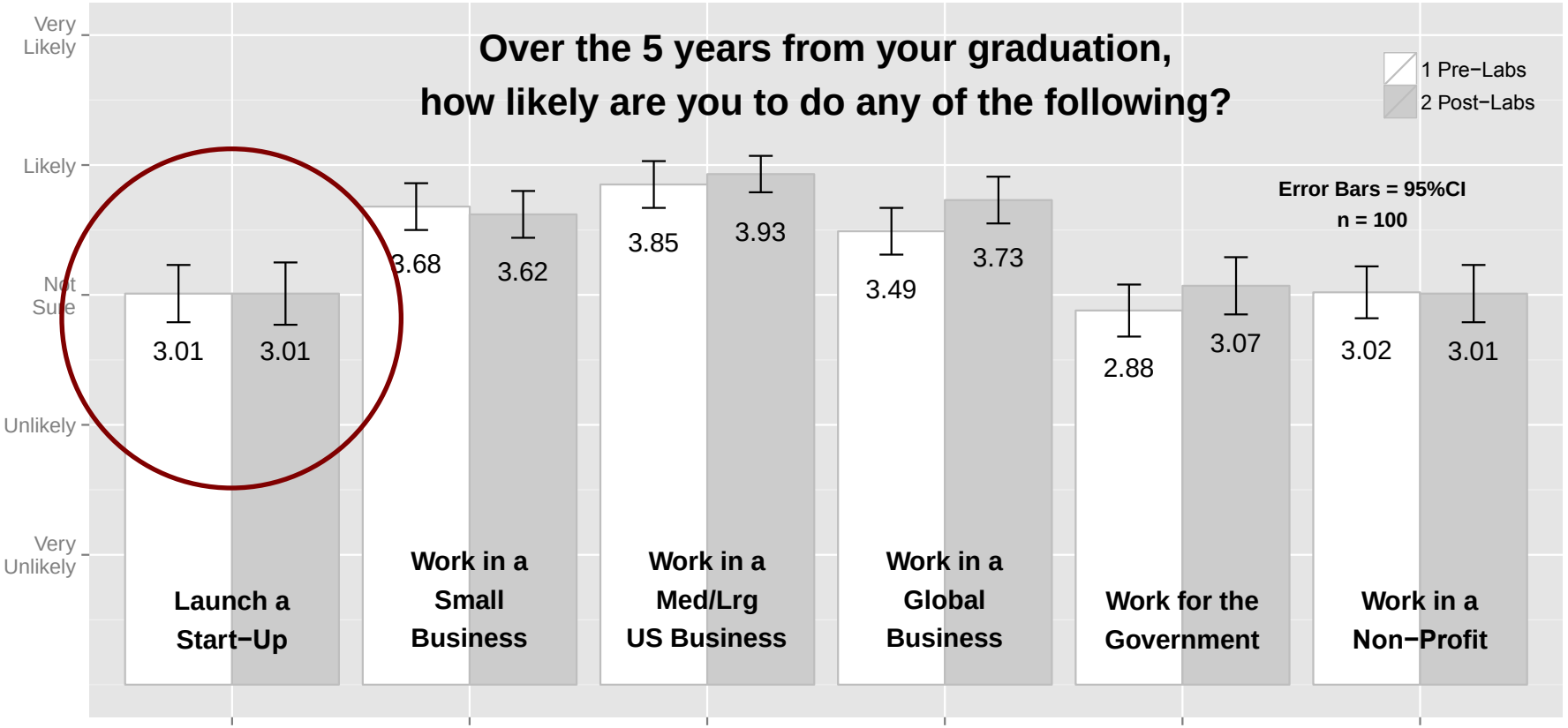


David Kolb
Learning Style Inventory (LSI)

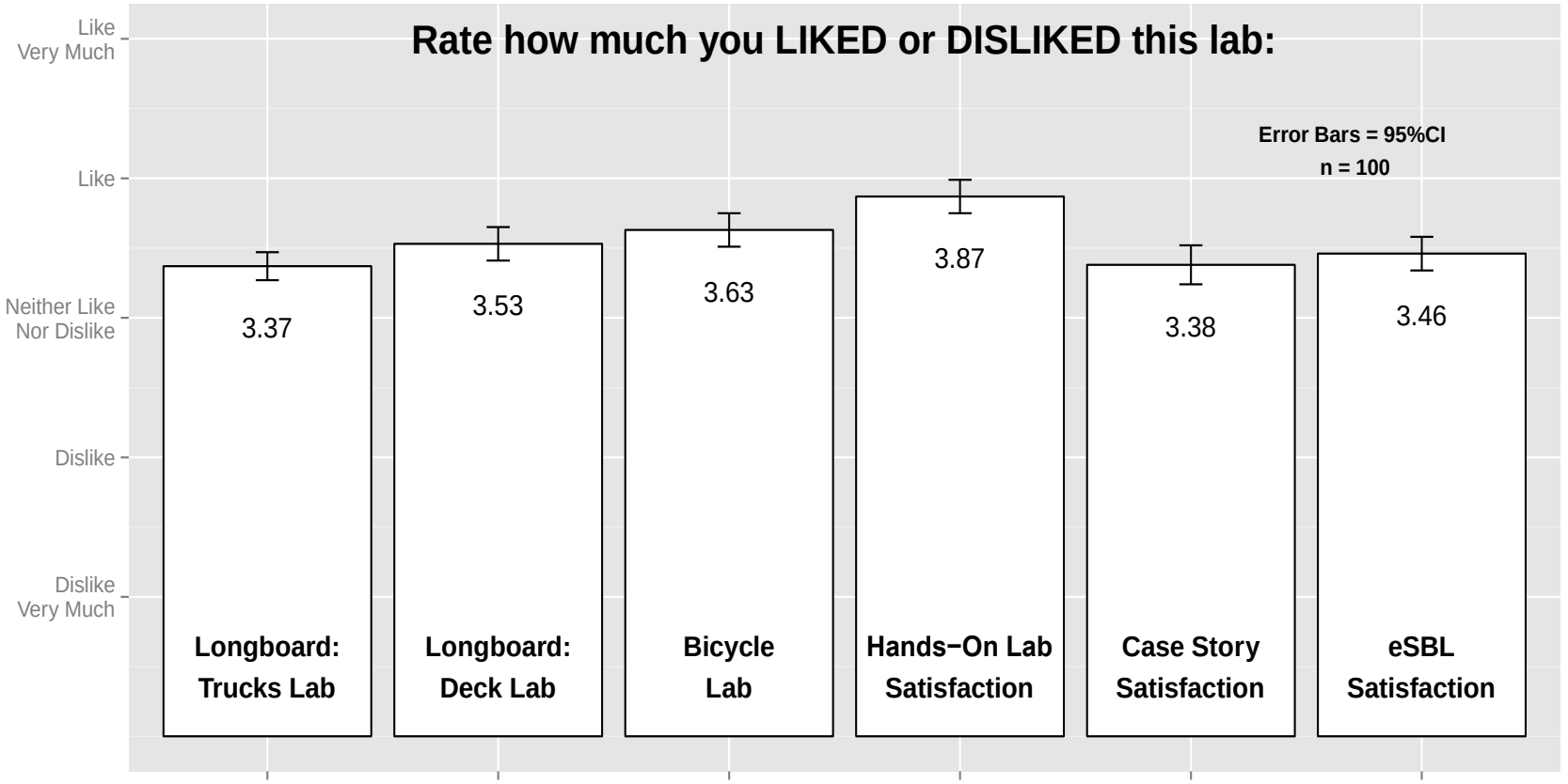
Entrepreneurial Curriculum – eSBL
Is it working?



Entrepreneurial Curriculum – eSBL
Is it working?



Entrepreneurial Curriculum – eSBL Student Perspective



Entrepreneurial Curriculum – eSBL Student Perspective

“Just stick to the engineering lab. It's cool that its about longboarding and all, but why have the crazy story about some startup with two people etc? Just do the lab and be done. All this random business stuff is annoying; you hear it all over campus already. This is an engineering class. Leave it that way. If I wanted business stuff and didn't care about engineering, I'd go be an [engineering business] major.”

Entrepreneurial Curriculum – eSBL Faculty Perspective

Challenge:

- "carving out" class and assignment time for topics beyond those traditionally covered. Some topics are lost

Approach:

- Carefully identify what are the key mechanics topics, concepts and procedures that are core to the course; these must remain

Challenge:

- Introducing topics of design and business may be a stretch for some faculty

Approach:

- Partner with an expert in business and entrepreneurship
- Engage TA's – they know more than you think

Challenge:

- Finally … adds complexity, no doubt about it

Approach:

- Also adds energy … as students work (and argue) with one another about how to use the mechanics and business ideas to make well thought out (rational?) decisions on product direction

Entrepreneurial Curriculum – eSBL Three Top Priorities

- **Introduce the Language of Business**
  - Well-established link between vocabulary and achievement
  - Words = “Containers for Concepts”
- **Wrestle with Ambiguity**
  - May be more than one “correct answer”
  - Practice both **Convergent** and **Divergent** Problem Solving
- **Grow Business Self-Efficacy**
  - “Engineering is hard, business is easy”

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Thank you!

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