Leveraging Engineering Curricula to Attract a Broader Audience

-OR-

HOW THE WEST WILL BE WON:
NEW INROADS TO TEACHERS AND STUDENTS

Bill McKenna, 2010
william@math.utexas.edu

What's the difference between science and engineering? What about technology?

- Empedocles

- Theodorus

Modern Perspectives

- “Engineering experimentation is framed by producing a desired outcome, whereas scientific experimentation is framed by understanding causes and effects. (Shulman, 2005)”

Play time!

PLEASE GET IN PAIRS OR SMALL GROUPS AND HAVE A REPRESENTATIVE GO TO THE TABLE AND SELECT AN ITEM.

IN YOUR GROUPS TALK ABOUT EACH ITEM FROM AN ENGINEERING PERSPECTIVE AND A SCIENTIFIC PERSPECTIVE.

Your Thoughts

The ant:
Sci: understanding laws and theories and how they apply.
Eng: taking those to apply; use of sensors for docking systems, cars, etc.
Bubbles:
sci: chemical composition, wind speed and shape,
eng: wand shape, ridges, how to make better bubbles
Flying thingy:
sci: experimentation, lift,
eng: how parts fit, diplay and function, wing shape, size v. power

Engineering in High School

TRAINING

LEARNING THEORY

OPPORTUNITIES

Training

- UTeach Engineering
- 5 year NSF grant entering 2nd year
- 2nd cohort of teachers about to enter summer institute
- Replication sites at UT Dallas and UT El Paso
- General Goals
  - Increase representation of women and minorities in engineering
  - Foster learning environments that reflect authentic engineering practices

What do you mean "authentic engineering practices"?

- Interviews of 100+ registered engineers (Jonassen, 1996)
  - Workplace problems are ill-structured with multiple competing goals and multiple solutions.
  - Constraints are often not engineering constraints.
  - Problem solving knowledge is distributed among team members.
  - Most projects require extensive collaboration.
  - Engineers recommend more communication skills in engineering curricula.
  - Engaging in iterative design processes.

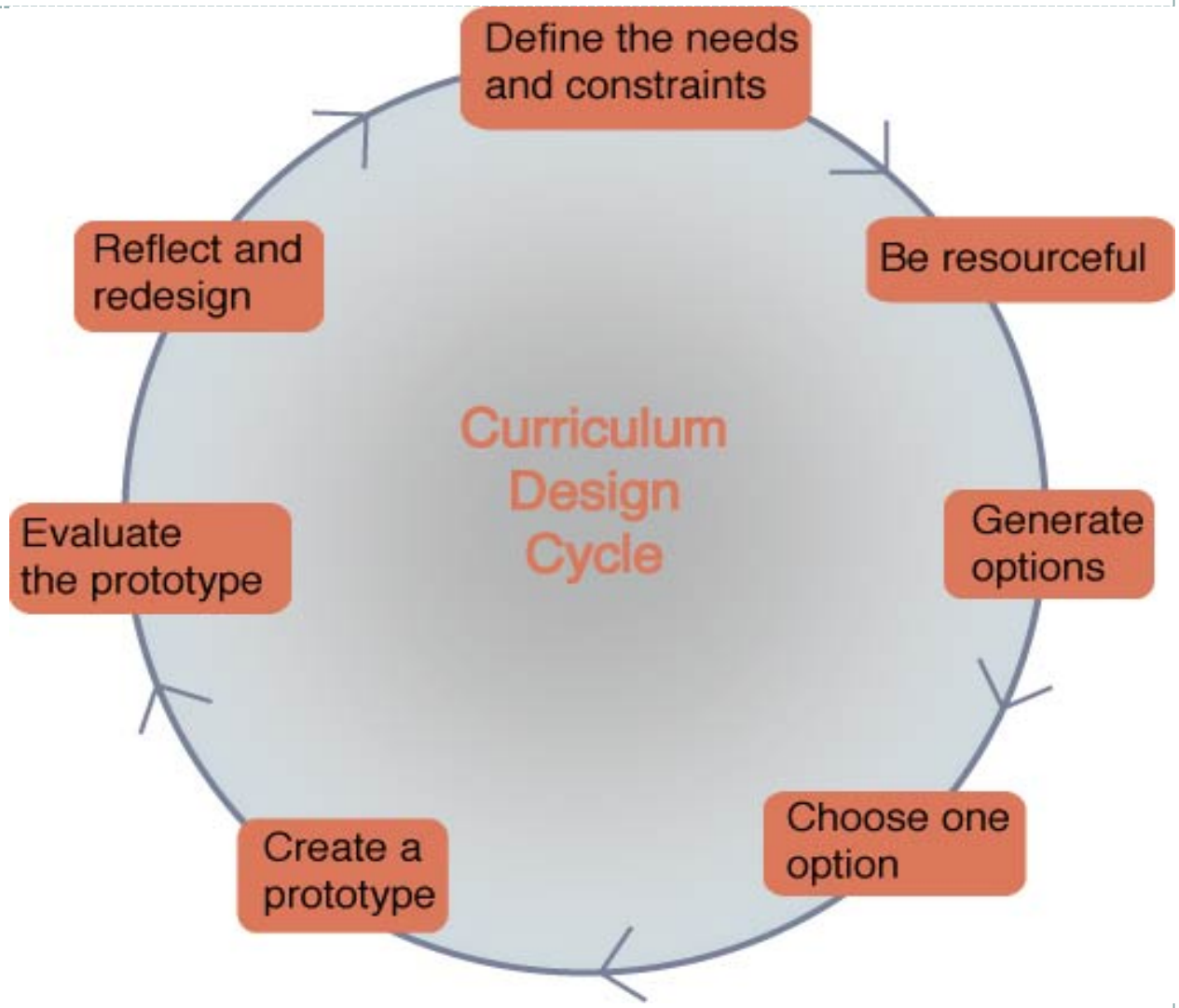
Design-based Learning

Constructivism

Constructionism

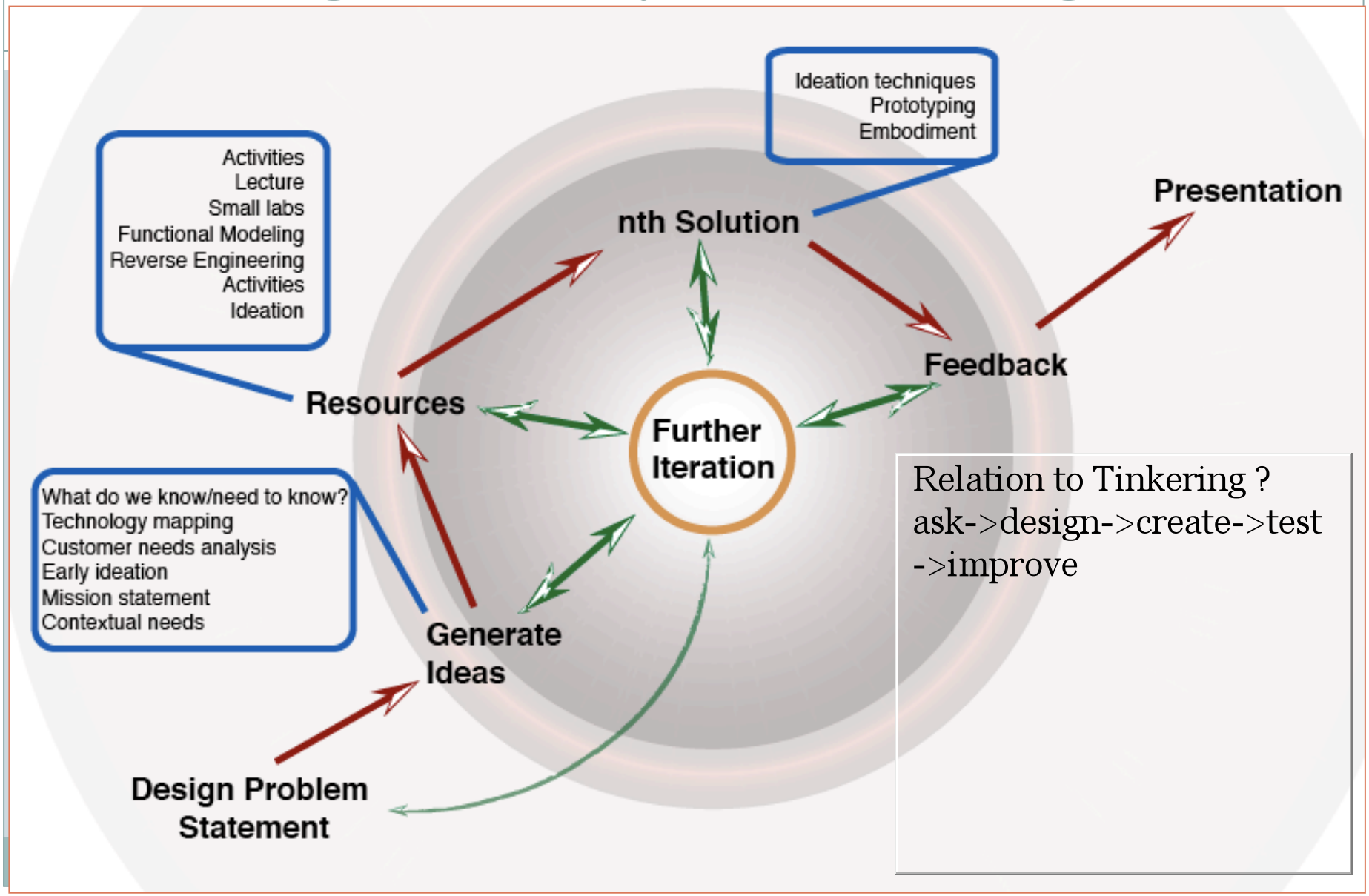
PBI

CBR



Methods

Design is usually messier though…



Opportunities

- Engineering TEKS written to allow diverse content
- As of yet, no standardized test for engineering!!
- It's not that we need to bring engineering to diverse communities, it's that we need to recognize that engineering design is a culturally and value laden enterprises.
- Diverse cultural knowledge is essential to the future of this profession.

Engineering as Experiential and Communicative

- Fostering collaboration in the classroom
  - Extended projects
  - Group work with defined roles and responsibilities
  - Open discussion about acceptable norms and behaviors (student led—teacher guided)
  - Teacher modeling of supportive and respectful language
- Constructive student discourse practices
  - Use claims, evidence, warrants, rebuttals (Toulmin, 1964)
  - Have many opportunities to give and receive criticism

Developing Habits of Mind

LANGUAGE AND THOUGHT ARE INEXTRICABLY LINKED.

TO DEVELOP HABITS OF THOUGHT, WE MUST CONCURRENTLY DEVELOP HABITS OF COMMUNICATION.

WHAT CAN YOU DO TO GET YOUR VISITORS TALKING TO EACH OTHER?

Thank you!

References

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