Week 3 Lecture
Creative Problem Solving
October 14, 2011
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What is creativity? Why is creativity important?

• “Creativity is the genesis of original ideas that have value” – Ken Robinson

• Revolutionary design requires a creative and innovative approach. By analyzing problems in new and different ways, we open ourselves to new and different solutions.

• When is this useful?
  – When the problem cannot be solved.
  – When constraints restrict your ability to solve problems conventionally.

• Unfortunately, very little of the engineering curriculum is geared towards the development of creativity
What inhibits creativity?

- Lack of structure/too much freedom
  - “Learn the rules so you know how to break them properly” – Dalai Lama XIV

- Fear of failure
  - “I have not failed. I’ve simply found 10,000 ways that don’t work.” - Thomas Edison

- Lack of process/pipeline
  - It’s counterintuitive, but creativity requires a methodology. Regularly use a structure like mind-mapping to increase your creative output

- Overcoming inertia
  - Dictionary design
  - Movement
  - Meditation
Convergent vs. Divergent thinking

- Convergent thinking requires eliminating possibilities to obtain a singular, correct answer.
  - For example, solve the series: 1, 1, 2, 3, 5, 8, 13, ?
    - A) 22
    - B) 21
    - C) 20
    - D) None of the above
- This reflects a “many to one” approach
- Highly linear thought process
- Conversely, divergent thinking stems from a “one to many” approach and is a lateral thinking process
- Please take out a sheet of paper
The Candle Problem
Functional Fixedness vs. Functional Fluidity

- Functional fixedness is a “mental block against using an object in a new way that is required to solve a problem.” – K. Duncker

- We constrain our ability to solve problems based on our conventional understanding of the way things are. We block ourselves from novel solutions because it is difficult to use a familiar object in an unfamiliar context.

- Put another way, when all you have is a hammer, every problem looks like a nail.

- As engineers and problem solvers, we cannot limit ourselves to common or conventional lines of thought.
Solution to the Candle Problem
Case Study: IDEO and the Deep Dive

- IDEO is one of the world’s foremost industrial design firms, largely due to their creative and open approach to the design process.

- ABC Nightline documentary of a design charette for a next generation shopping cart.

- [http://www.youtube.com/watch?v=M66ZU2PCIcM](http://www.youtube.com/watch?v=M66ZU2PCIcM)
IDEO Takeaways

• Encourage “WILD” ideas

• Enlightened trial and error succeeds over the work of the lone genius

• Fail early in order to succeed sooner
Tower Task

• You should all be sitting with your teams. If your team is larger than 5, divide into groups of 5 or fewer people. If you’re not with your team, find the 3 or 4 people nearest you. They are now your team.

• Send one representative from each group to the front to obtain:
  – Bundle of pasta
  – 3 feet of tape
  – One marshmallow

• You will have 20 minutes to construct the tallest freestanding tower possible using only pasta and tape. The marshmallow (intact) must be at the top of the tower. Your objective is to elevate the marshmallow higher than any other team.