Innovation and Creativity

Can it be taught?

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Predicting the future
Why do we need Medical Science *Innovators*?

Why aren’t we solving the greatest scientific problems of the world today?
Benjamin Franklin

Can this type of thinking be learned??

Bifocals
Lightening rod
Franklin Stove
First flexible urinary catheter
Swim fins
Odometer
Innovation in Medicine

TV Show - “House”
Can we teach this?
What is Innovation?

“Change that creates a new dimension of performance” - Peter Drucker

“The ability to see change as an opportunity, not a threat” - Steve Jobs
Technology / Innovation

Labor | Materials | Capital | Energy | Information

Process

Outputs of Higher Value
Innovations

**Sustaining**
- Maintain rate of improvement
- Something more or better in the attributes they already have
- Make product or service better in ways which are already valued

**Desktop computers**

**Disruptive**
- Different attributes, cheaper, simpler
- Perform worse along one or two dimensions
- Doesn’t address next needs of current users

**Laptop computers**
The Progress of Innovation

- **Performance**

- **Time**

- **Desktop Computer**

- **Laptops**

- **IPad**

Performance trajectory of present technology (driven by sustaining innovations)

Most-demanding customers

Least-demanding customers

Performance that customers in the mainstream market can absorb
New market

Low end
Innovation Can Be . . .

- Step-wise or linear

- Transformative
  - Light Bulb
  - $E = MC^2$
  - Medical Treatment
    - $H.\ pylori$
Innovative Thinking – Basic Tools

• Frames – Context

• Perspective Shift – Change your Point of View

• Observation

• Analogy

• Search - Re-arranging the elements
Solve this mystery......
What if…….
Look for the unexpected.....
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“Frames” and Point of View
Change your point of view……..
Context and Point of View
Innovative Thinking – Basic Tools

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Become a Better Observer
What do you see?

Young Woman?
Older Lady?
Older Man?
H. Pylori Story – Stomach Ulcers

• Warren - Pathologist
• Marshall – Gastroenterologist
• Warren saw these black spots in biopsies of ulcers and wondered what they were
• Marshall suggested that they looked like bacteria
• Frame at the time was bacteria cannot grow in acid
• When it was proposed, nobody believed it
• Marshall drank H. Pylori – gave himself an ulcer
Example: Drug delivery by aerosol

Advantages
- Easy to administer
- Drug is solid, more stable
- Avoid IV problems

Disadvantages
- Low dose delivered (< 5%)
- Particles stick together in back of throat
- Poor deep lung penetration

Solution: make them smaller and denser
Advantages of porous aerosols for inhalation therapy

Optimal size for deep lung deposition

Advantages of large size for therapeutic aerosols
- Easier aerosolization and flowability
- Less prone to phagocytosis
Particles deposited (X10^5)

Porous
Nonporous

Lobe number
Pharmacokinetic profile of estrolast

Estradiol Concentration (pg/ml) vs. Time (hr)

- Estrolast® Inhalation
- IV Injection

Duke Medicine
Once you start it is hard to stop!!
Innovative Thinking – Basic Tools

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Analogy
– explore connections between different areas

Sharks move fast through water

Sharks have “V” shaped ridges in skin

Speedo designed artificial swim suit with ridges

28/33 Gold medal winners wore this suit
Innovative Thinking – Basic Tools

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- Observation
- Analogy
- Search - Re-arranging the elements
Nothing really new – just new arrangements

Search!
Different approach!
Power of Brainstorming

Genius was 1 percent inspiration and 99 percent perspiration.

The best way to have a good idea is to have lots of ideas.

It is better to have enough ideas for some of them to be wrong, than to be always right by having no ideas at all.
Innovative Thinking – Basic Tools

Frames - Context

Perspective – Point of View

Observation

Analogy

Search – Re-arranging the elements
Skate to where the puck is going!

"...A GREAT hockey player plays WHERE THE PUCK IS GOING TO BE."

-Wayne Gretzky