

Time	Item	Clock
10	Introduction of the class & myself ... name & major	
10	What's special about this class ... Looking for that snowflake ...Fun and Learning	
5	Tina's movie ... opportunities	
15	Safety Discussion in the Lab	
5	Format of the class Project leaning .. Using questions of the subject area	
10	OnCourse review ... Your picture and story	
15	Rubric for us ... How do we want to be judged? What makes it exceptional, adequate or needs improvement	3:10
15	Break	3:25
25	About Engineering and Science definitions, show IDEO movie	3:50
10	Form Teams	4:00
15	Design your classroom	4:15

First Day Conti.

Time	Item	Clock
	Design your classroom	4:15
15	Overview of problem Solving ... Define the problem	4:30
30	Brain-writing exercise	5:00
	What Bugs you? Make a list and bring it in tomorrow. ... It is a problem you have that needs to be solved	

@nd Day 1/31/2012

Time	Item	Clock
25	Shaping	
25	Decision Making	2:50
20	6 Hats ...Dialogue	3:10
20	Framework/ National Standards	3:30
15	Break	3:45
55	Design	4:40
20	Reflection and Next week	5:00

PONDS TO PARTICLES

INT110

Course Content:

- Science Discussion
- Design activity exercise:
- Dialogue Question:
- Pedagogical skill:
- Assessment

Breaks, Snacks and Rest rooms

Expectations: Work , Persistence + Play = Learning and Fun

This weeks activity

- ❑ Syllabus / OnCourse Site
- ❑ Excitement of this content H₂O=LIFE
- ❑ How do we want to be judged
- ❑ Lab Protocol .. Erin Post
- ❑ Green House ... Jane Young
- ❑ Methodology ... Science/ Engineering
- ❑ Thinking Skills tie-in
- ❑ Teams ... 6 Hats
- ❑ Doing a Project

**Tell me and I'll forget.
Show me and I'll remember.
Involve me and I'll understand
- Confucius**

We are convinced that engagement in the practices of engineering design is as much a part of learning science as engagement in the practices of science

...Science common core ... Preliminary draft July, 2011

Safety

Dr. Tina Seelig

is the Executive Director for the Stanford Technology Ventures Program (STVP), the entrepreneurship center at Stanford University's School of Engineering. STVP is dedicated to accelerating high-technology entrepreneurship education and creating scholarly research on technology-based firms. She teaches courses on creativity, innovation, and entrepreneurship in the department of Management Science and Engineering, and within the Hasso Plattner Institute of Design at Stanford.



STANFORD
TECHNOLOGY
VENTURES PROGRAM

Tina Seelig

Executive Director,
Stanford Technology Ventures Program
May 27, 2009

Dr. Seelig earned her Ph.D. from Stanford University Medical School in 1985 where she studied Neuroscience.



STANFORD
TECHNOLOGY
VENTURES PROGRAM

Tina Seelig

Executive Director,
Stanford Technology Ventures Program

May 27, 2009

EcoSystems

A community of different species interacting with one another and with their nonliving environment of matter and energy.



Our focus will be on fresh water communities and the impact that water plays in all systems.

- ❑ *The essence of environmental literacy is our response to the questions we learn to ask about our world and our relationships with it.*
- ❑ *Environmental literacy demands understandings, skills, attitudes, and habits of mind that empower individuals to relate to their environments in a positive fashion.*

A QUESTIONING FRAMEWORK FOR SHAPING ENVIRONMENTAL LITERACY

Class Objectives:

- ❑ Blend science discovery with engineering creation to create a learning environment
- ❑ Begin a love for Environmental Literacy and the Power of Water in our society.
- ❑ Using interdisciplinary learning as a tool for students growth.

Objectives .. Syllabus

Have a better understanding of the nature of science inquiry

Have a better understanding of the engineering design process

Know some fundamental math and science concepts that our state and national governments consider essential for every educated citizen

Have an appreciation for the beauty and power of science and engineering as a way of knowing

Have an appreciation for the essential interdisciplinary of all of the science with one another, and with mathematics, humanities, and social science

Be able to write and talk about science and engineering

Future employers

whether in education or another field always want the same thing from a college graduate (no matter what your major!). Specifically, they say they want employees who:

- See problems as opportunities

- Can work well with others as well as independently

- Can think logically and solve problems effectively

- have learned how to learn

**What do you want out of this
class?**

Developing a Rubric

How do I measure success?

What areas (Categories) do I want to gather information to improve my capabilities?

Possible Rubric

Activity	Discussion	% of total
Individual assignments	This includes creating feedback statements, needs assessment, writing papers and individual assignments during the semester.	30
Team assignment	Ability to work with others, communication skills, being able to give constructive feedback.	30
Classroom discussion	This also includes on-line discussion boards.	20
Supporting a learning environment	This measures the attitude of the individual in making suggestions, taking risks in activities, and supporting the learning atmosphere.	20

Operating Principles

... setting a tone

- ❑ Expectations for classroom performance:
- ❑ To work as hard as you can in a playful manner and create an environment in which this can happen.
- ❑ How do we need to approach each other to maximize our efficacy towards meeting this expectation?

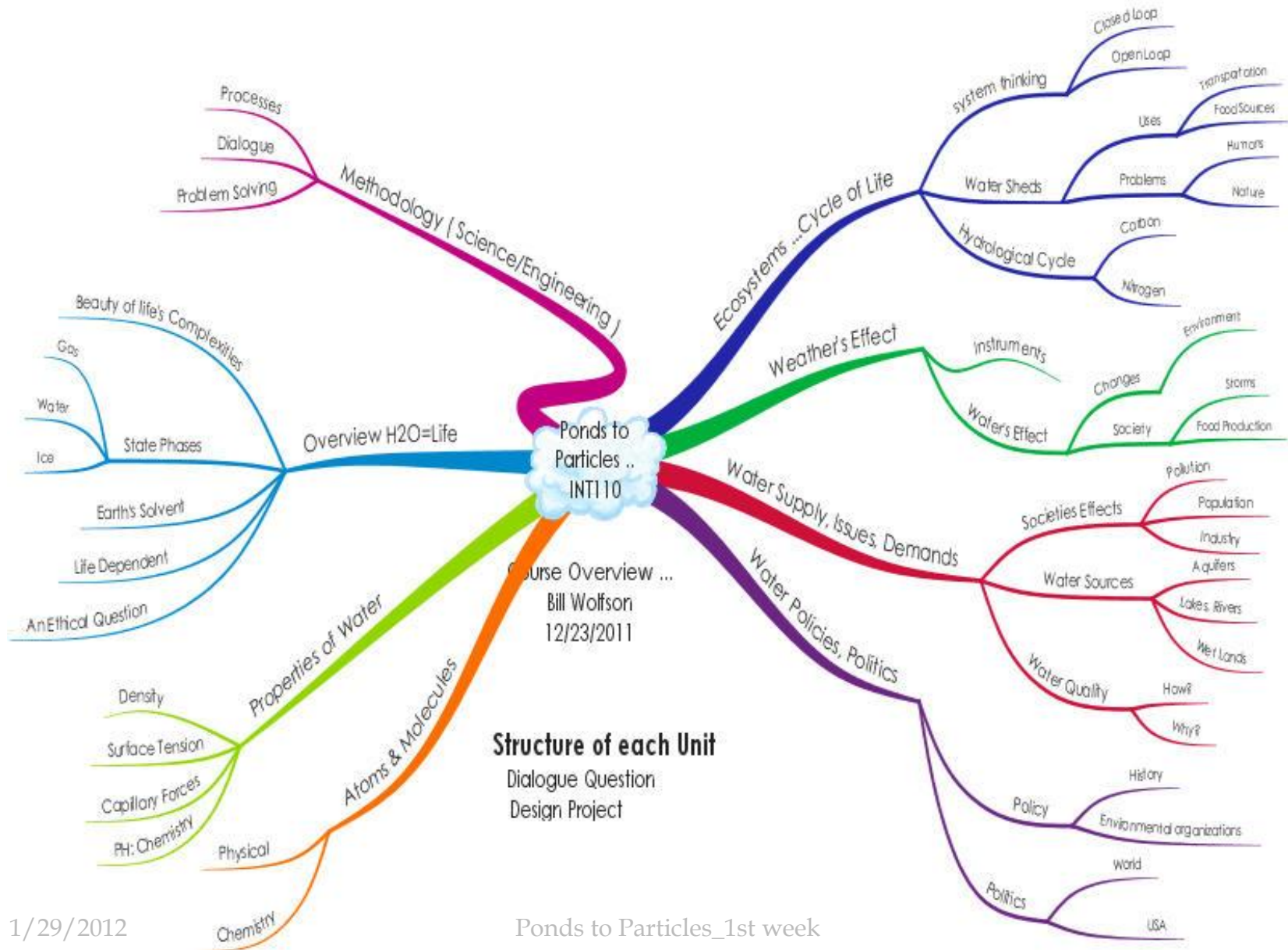
Work as a team

Do not put down an individual

OK to make a mistake

Use positive language

Course Overview

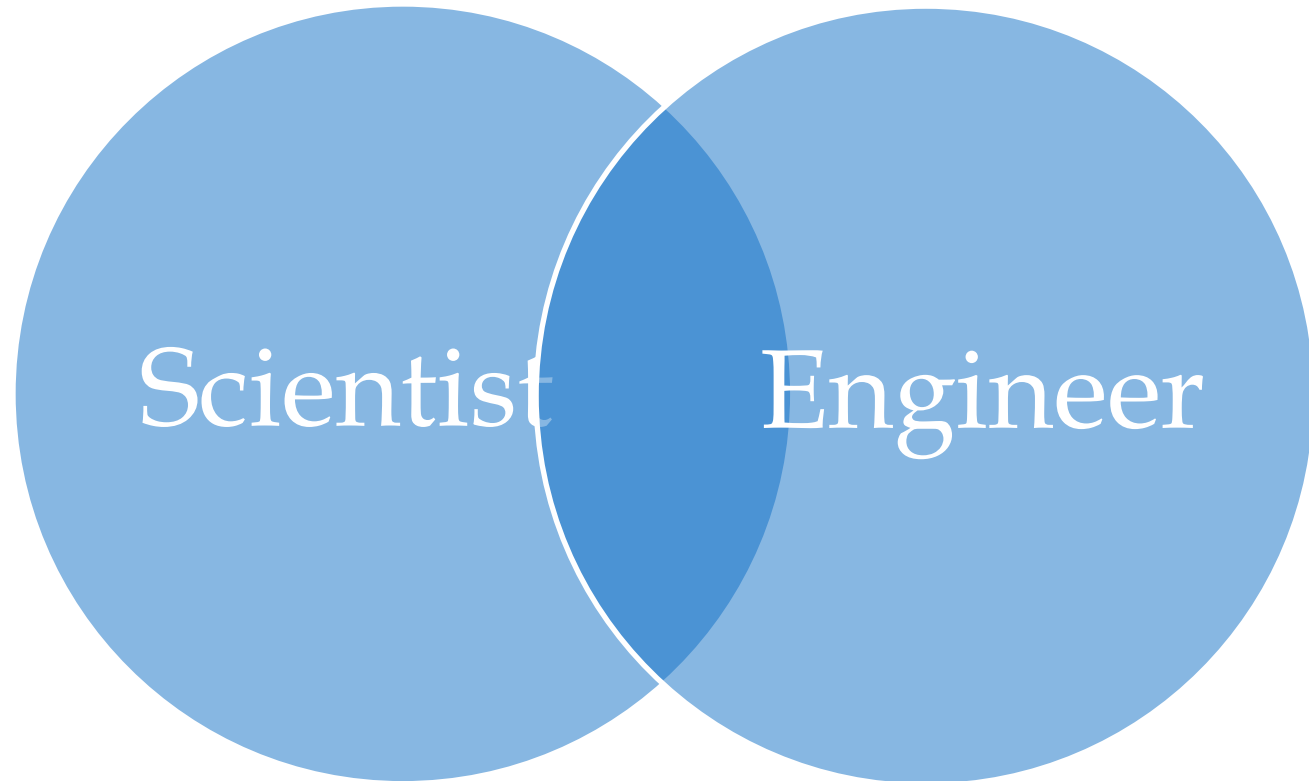


Teams

- Form Teams:
- Count off ...1-4
- Write on a 3x5 card “What area of the course interests you the most and what would you like to learn about it”
- Discuss with you team members.

Face to face interaction
Individual accountability
Group cohesion
Social skills development

What do we know?



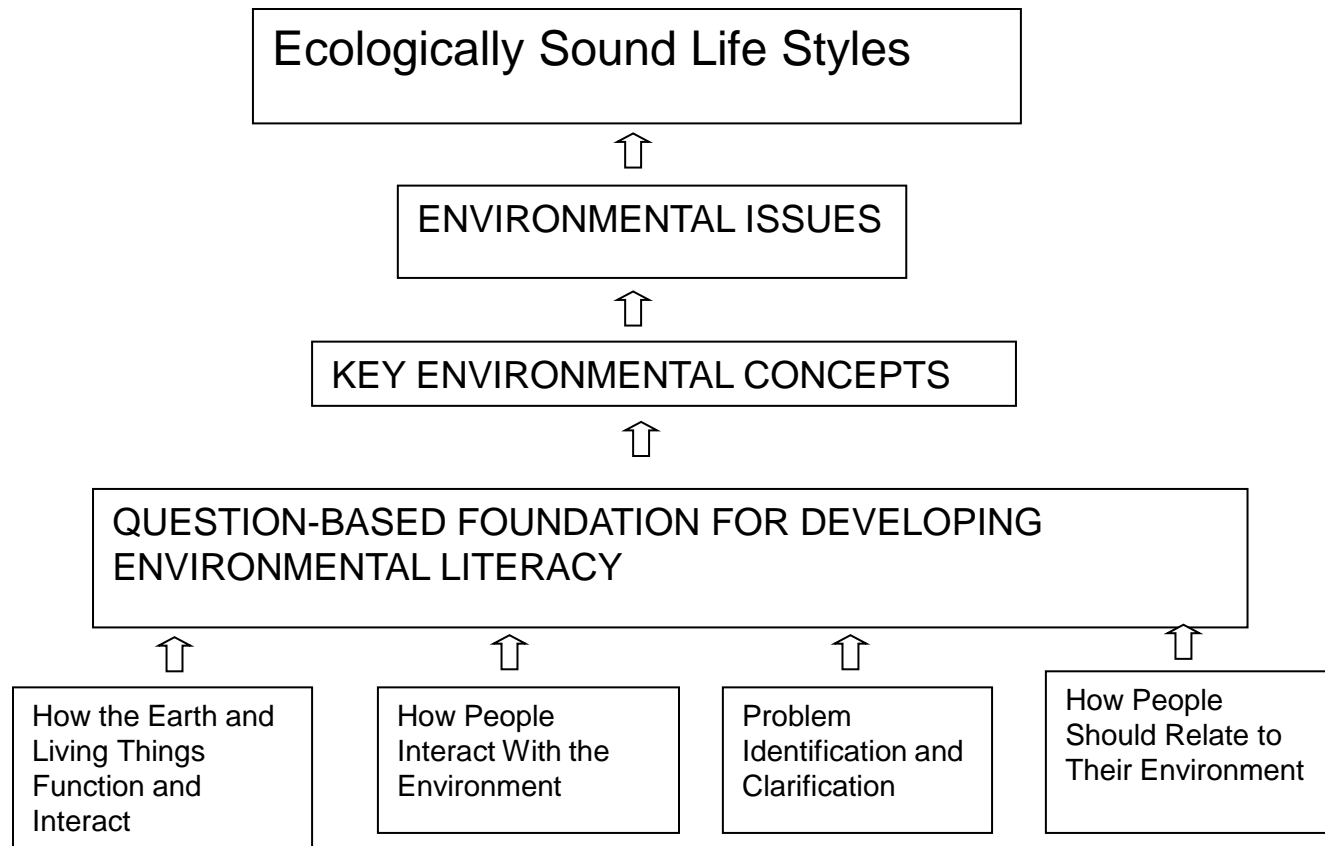
There are many great people who were both a scientist and engineer

- Leonardo da Vinci
- Richard Feynman (Nobel Prize in physics)

Definitions:

- ❑ **Engineers** design useful products & processes for society using all disciplines but mainly science and mathematics. (composite)
- ❑ **Science** is about explaining patterns in the universe. (composite)
- ❑ **Mathematics** is the language to manage/explain a design & account for the patterns in nature. (composite)
- ❑ **Entrepreneurship** is the practice of starting new organizations or revitalizing mature organizations, particularly new businesses generally in response to identified opportunities. The behavior of the entrepreneur reflects a kind of person willing to put his or her career and financial security on the line and take risks in the name of an idea, spending much time as well as capital on an uncertain venture. (Wikipedia) **Creating value where there was none!**
- ❑ **Artist:** a person whose creative work shows sensitivity and imagination. A follower of a pursuit in which skill comes by study or practice - the opposite of a theorist. people who use imagination, talent, or skill to create works that may be judged to have an aesthetic value. (Wikipedia)
- ❑ **Technologies** (products and processes) are the result of engineered designs. They are created by technicians to solve societal needs and wants. (Science Framework)

Using environmental issues to develop environmental literacy



FROM : 82_questioning.pdf

1/29/2012

Ponds to Particles_1st week

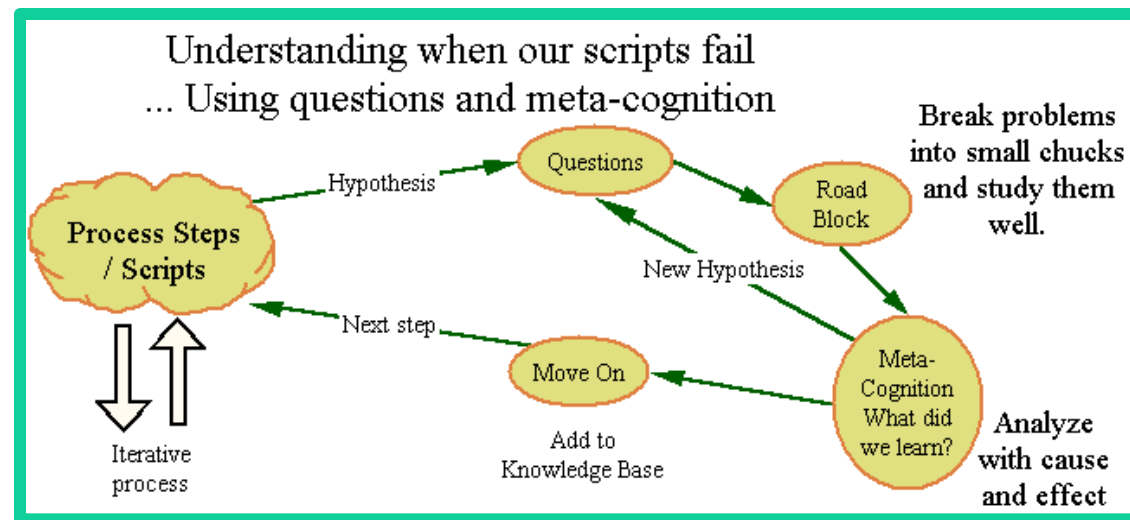
Use your thinking skills such as:

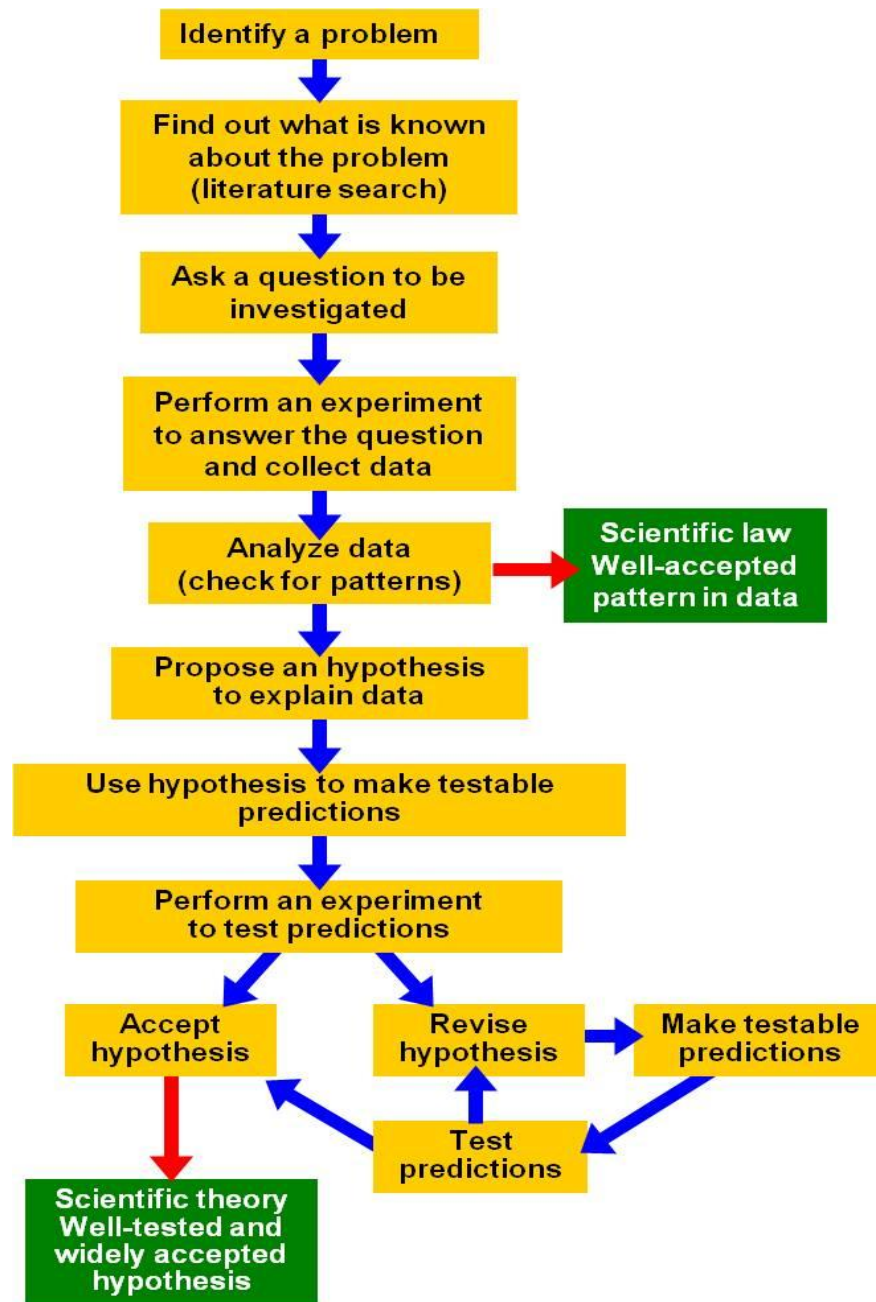
Creative thinking

Critical thinking

Meta-cognitive reflection

Questioning



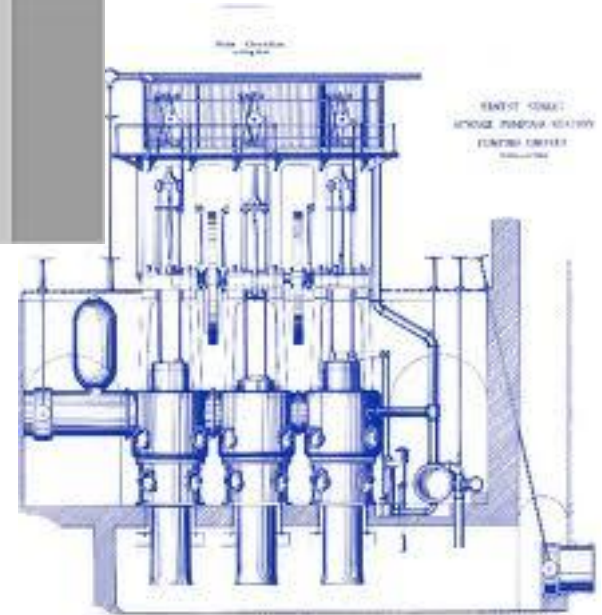
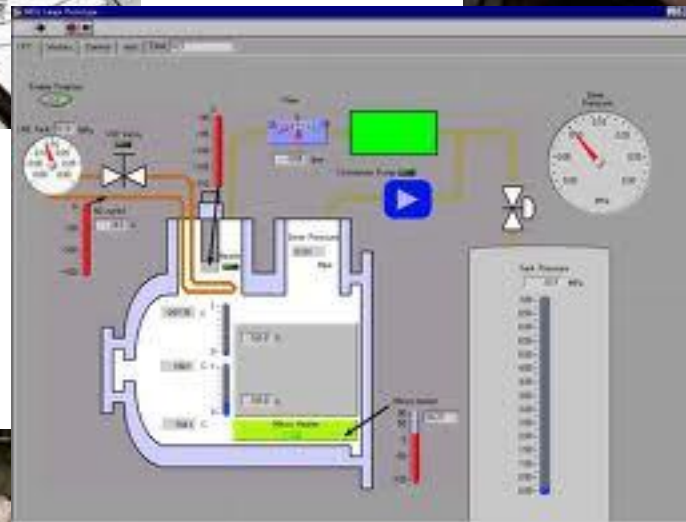
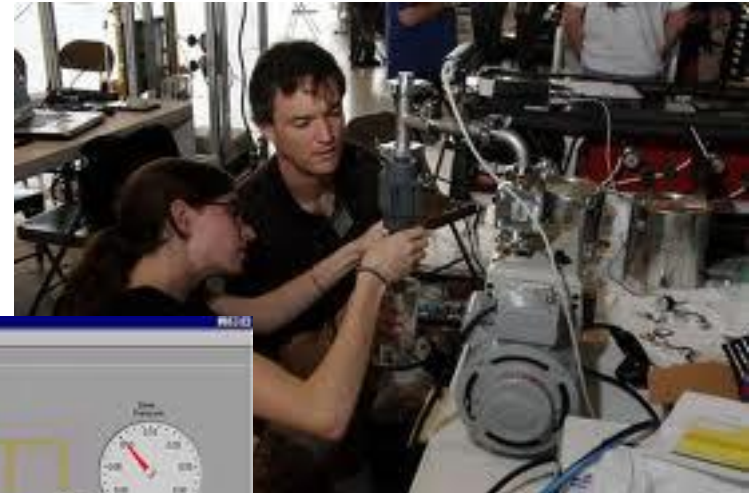


Define the unknowns in nature

Stepped Art

Fig. 2-2, p. 33

What does Engineering look like?





Design a classroom



major tasks process steps)
would you need to re-design a
classroom you will be moving into?

Take 10 minutes
at your table and
discuss and
create the tasks.

Lets keep it simple
No more than 8 tasks



Engineering

- Create useful products and process for society based on all disciplines but mainly science and math.

IDEAO Video

<http://www.youtube.com/watch?v=M66ZU2PClcM>

WHY ENGINEERING?

Engineering is **ACADEMIC GLUE** – it binds complex math and science concepts to real-world experiences and leads to learning that sticks with students

Engineering is **CREATIVITY** – it brings out the best ideas from the students

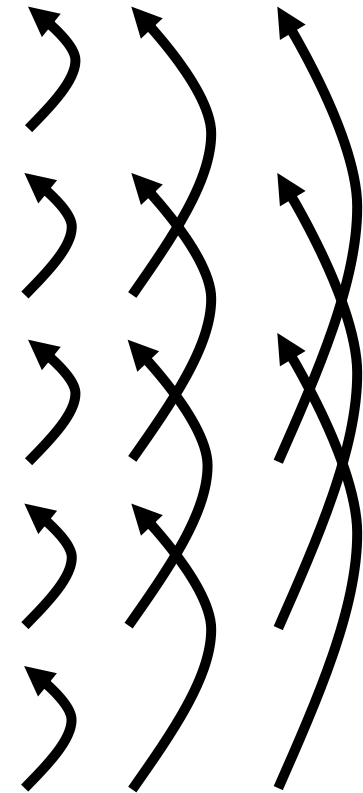
Engineering is **GROUP WORK** –students learn to communicate and work together while they learn math and science

Engineering is **EVERYWHERE** –students learn that engineers have designed, created or modified nearly everything they touch, wear, see and hear in their daily lives

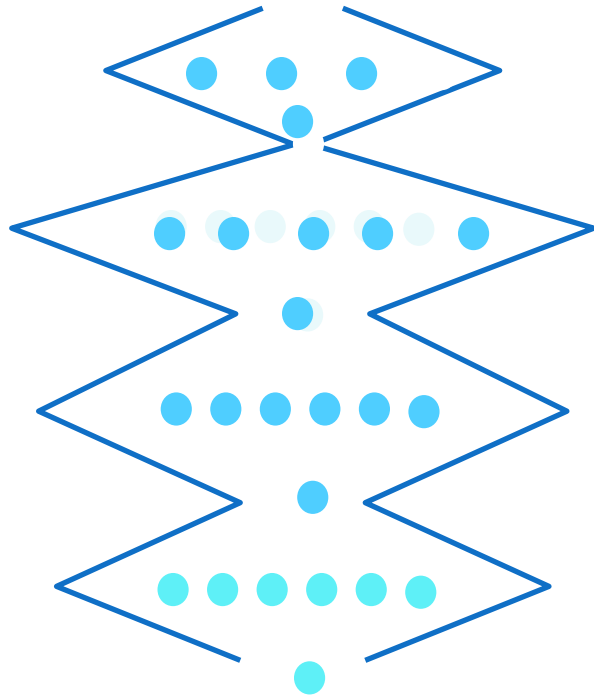
- People
- Needs
- Requirements
- Specification
- Product
- People

Reflection

- People
- Needs
- Requirements
- Specification
- Product
- People



Iterative process



- People
- Needs
- Requirements
- Specification
- Product
- People



Divergent/Convergent thinking

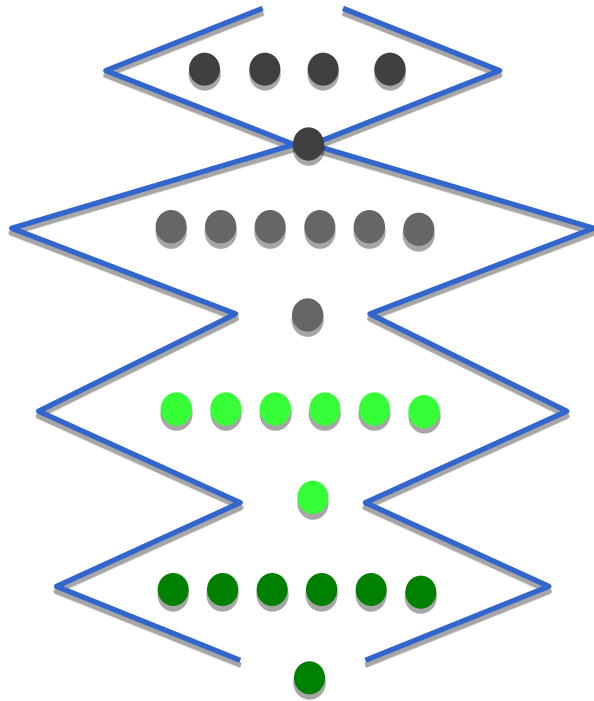
WHERE ARE WE GOING?

Connecting literature

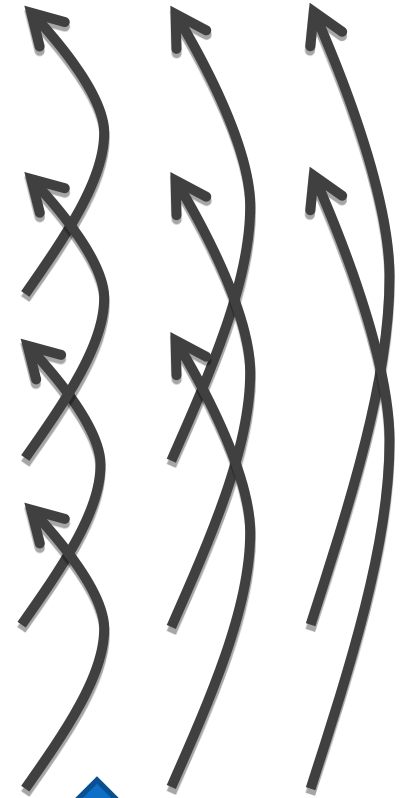
- Story/Characters
- Design Challenge
- Specification
- Designs
- Product
- Testing/ Feedback

Reporting

Iterative process



Divergent/Convergent thinking



What it looks like.

Design Problem or Challenge

"It bugs me when my coffee gets cold."

- Needs

Divergent:
Generate raw ideas

Use solar power!

Drink Tea!

Convergent:
Define requirements

Coffee Warmer REQUIREMENTS

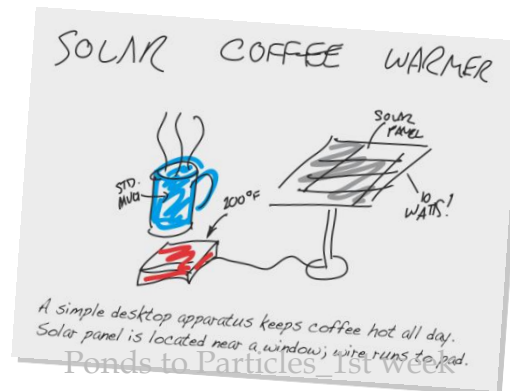
The design should...
Be no larger than...
Cost no more than...
Keep coffee at...

- Requirements

Divergent:
Generate alternatives

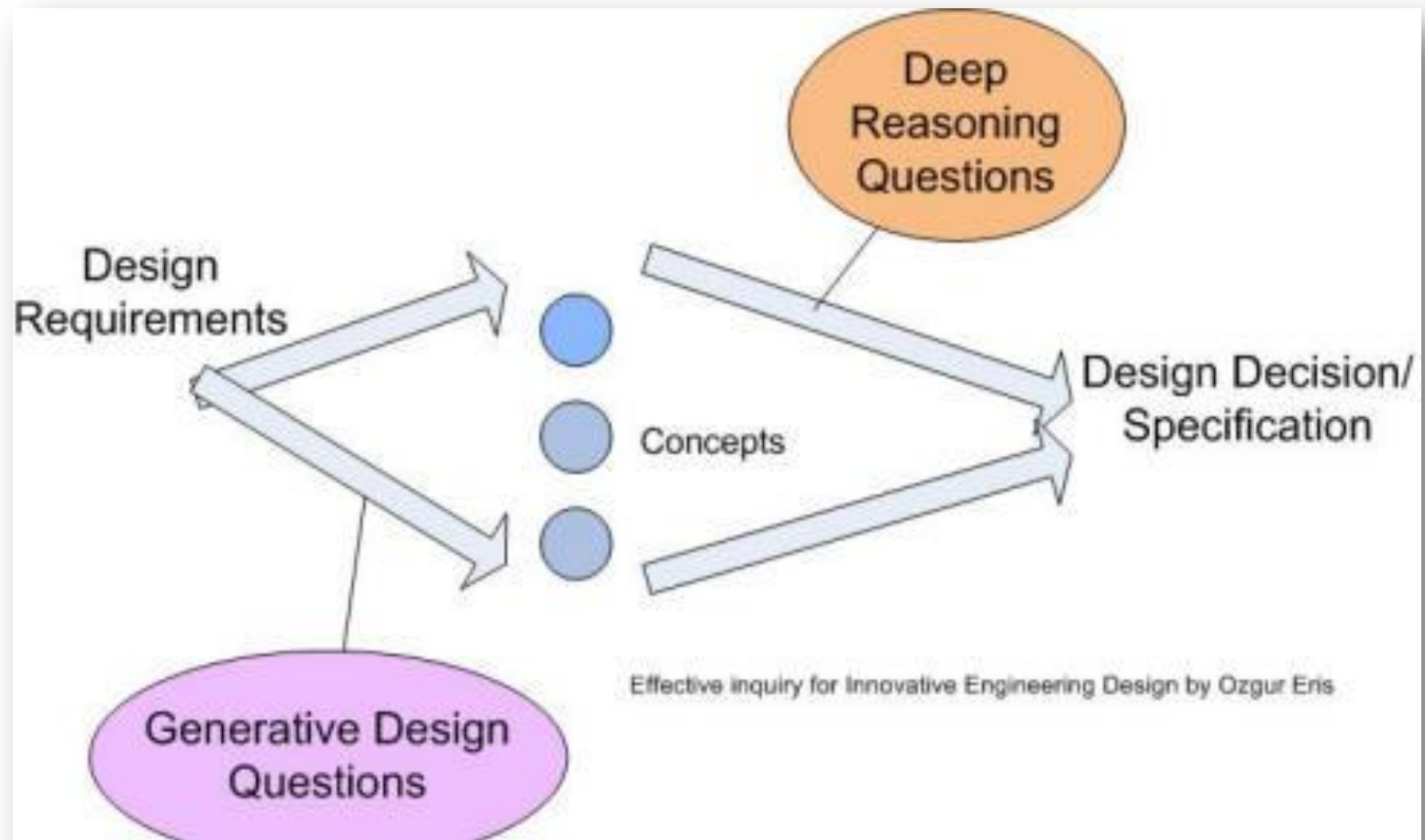


Convergent:
Select an approach



- Specification

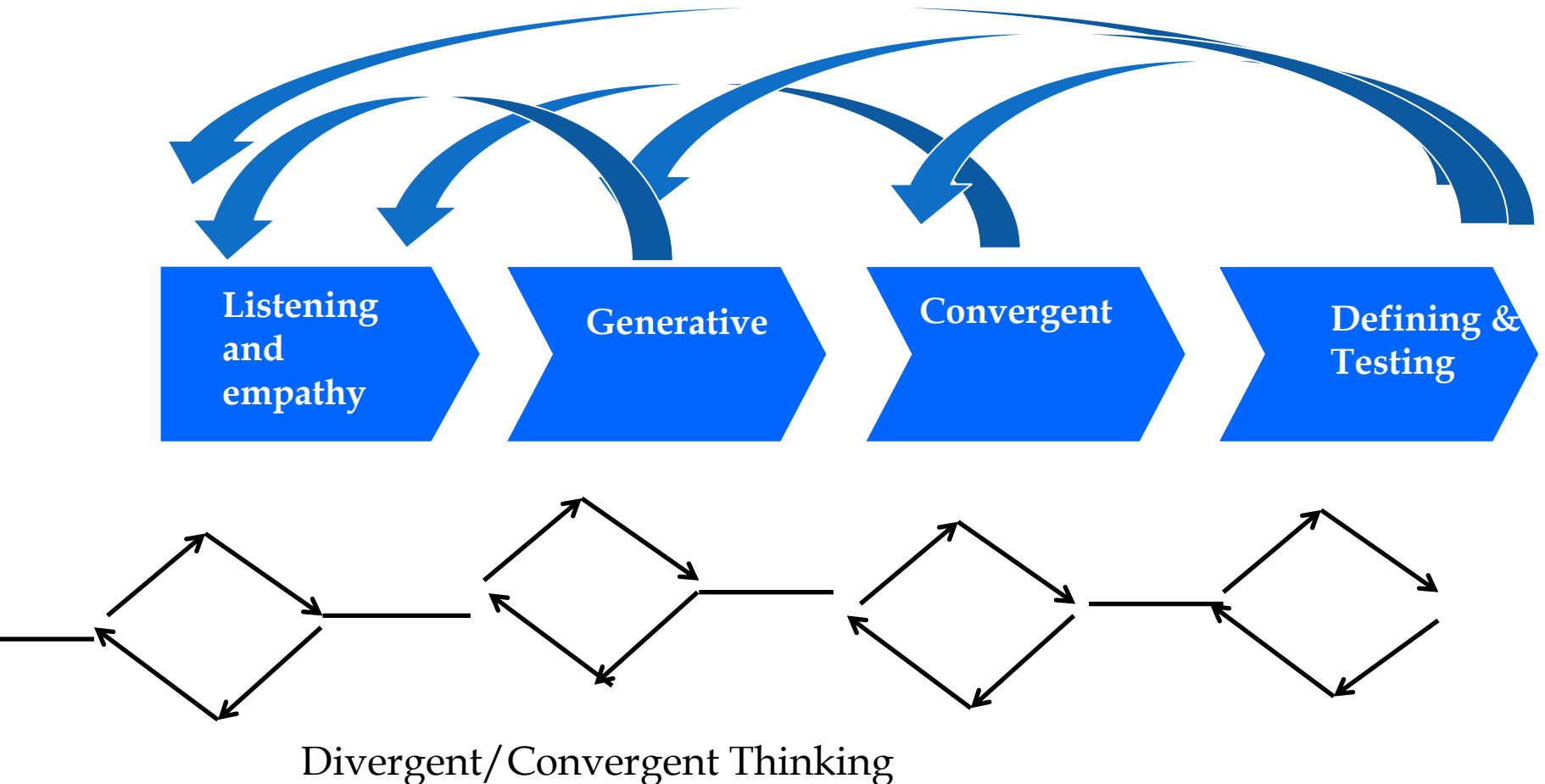
Design



Engineering Design is a question-driven process! ... Ozgur Eris

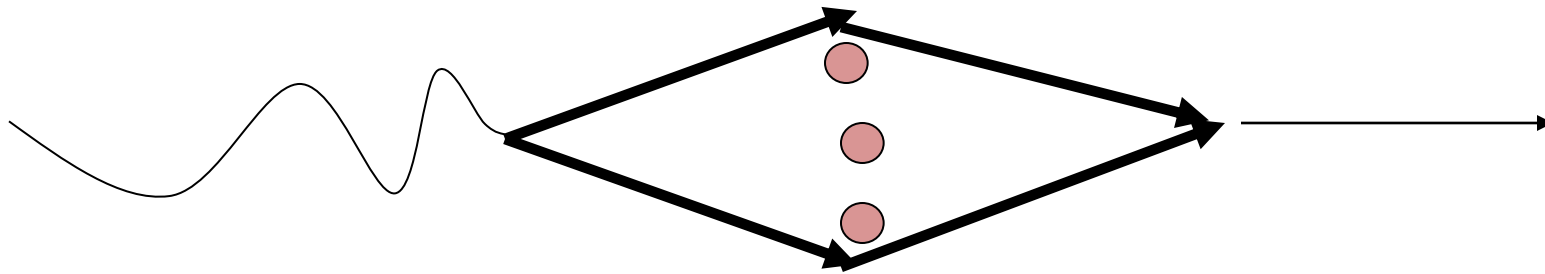
Summary Thoughts

It's all about these elements



Works systematically to listen, developing many ideas, see what fits best and define to your customers.

Summary Process



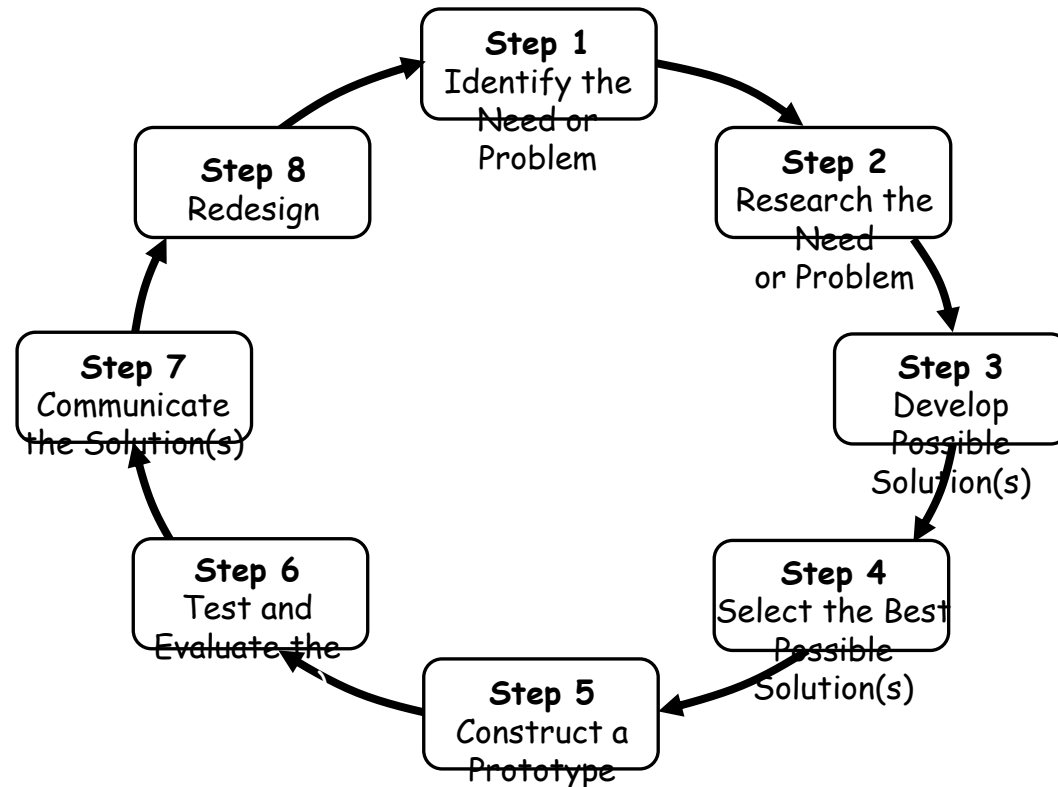
Priming	Generative	Convergent	Defining
Story Mapping	Brain Writing	Discussion of Pro/Con	Gallery Sketches
Needs	Morphological Analysis	Shaping	Modeling/Building
Problem Framing	Shaping	Requirements	Posters
Values	Brain Storming	Decision Matrix	Presentation
OTHERS			

Listen to the needs and values of the customers

- Generate raw ideas for a given challenge
- Select an idea that is particularly interesting
- Identify the requirements for that concept
- Come up with multiple solutions that meet the requirements
- Select a solution, based on the requirements

MA Framework

Strand 4 Engineering & Technology



The Problem Is To Know What the Problem Is

Defining the problem ... 5

Whys

Brain Writing

Shaping

Decision Matrixes

Problem

- Here are the Grand Challenges for engineering (21st century) as determined by a committee of the National Academy of Engineering:

Make solar energy economical

Provide energy from fusion

Develop carbon sequestration methods

Manage the nitrogen cycle

Provide access to clean water

Restore and improve urban infrastructure

Advance health informatics

Engineer better medicines

Reverse-engineer the brain

Prevent nuclear terror

Secure cyberspace

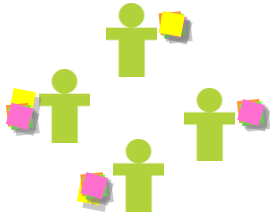
Enhance virtual reality

Advance personalized learning

Engineer the tools of scientific discovery

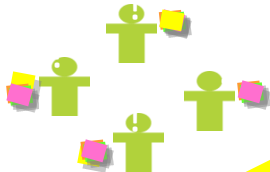
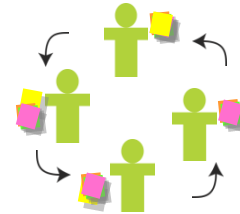
Generate Possible Solutions using Brain-writing

Starting with 4-5 generative framings...



Each team member generates
3-4 ideas on their own.

Pass ONE of your ideas to your right.



Read your neighbor's idea, and generate
an idea that is somehow inspired by it.

**One idea per
card or sticky
note!!**

Repeat until time is up.

Shaping Ideas

Why generate crazy ideas?

So you can shape them into innovative ideas!

Leaves falling on the lawn...

Use a leaf
blower

1



!?

Trees that
pick up

!!!??

magic

Now Shape your ideas!

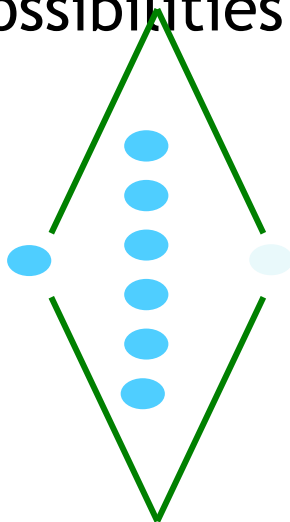
everyday, innovative, magical
shape your ideas from brain-writing.

- Remember that you can shape ideas to meet constraints and values
- Choose 2-3 “favorites”, taking values and constraints into account. Create innovative ideas
- Be bold!

Take 15 minutes
to sort and select

Converging

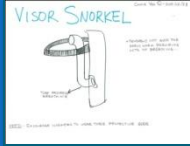
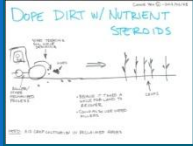
- Discussion: During the design process or problem solving we need to apply convergent thinking to narrow our options to a selection. When we have many options and are not comparing any to an existing one, the best option is to create a decision matrix where we establish a set of judgment criteria down the Y axis and weight each to its importance to judge our possibilities.



*Take 15 minutes
to sort and select*

Decision matrix

Items
being
compared

Requirements	Weight		
Total=			

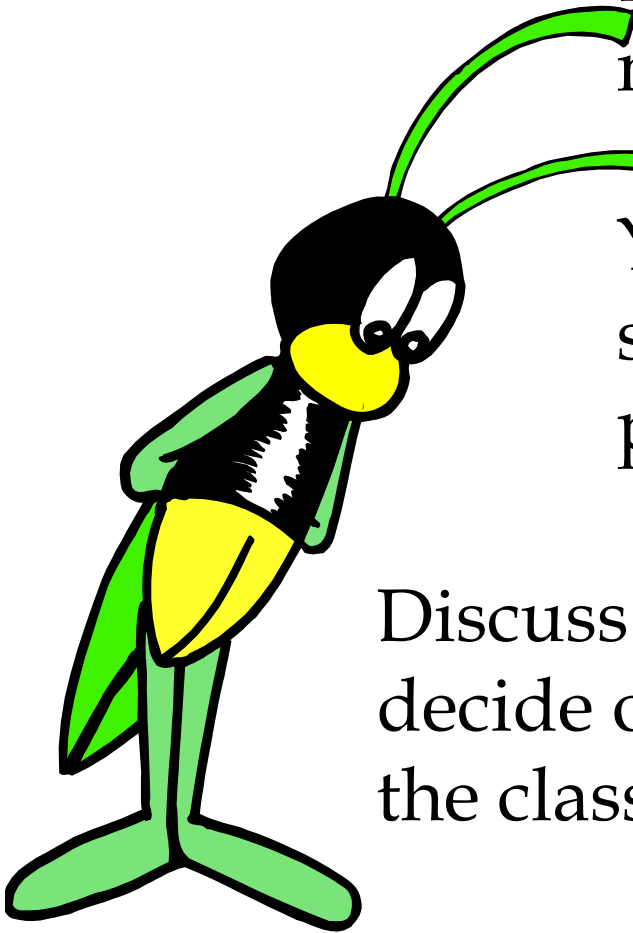
Importance
Very=10
Not=1

Lets start with a bug

Does the word BUG have two meaning?

YES... We talk about a bug as something that bothers me or a problem I have.

Discuss what Bugs you and as a team decide on what one you will share with the class.



Second Day

What Bugs you? Make a list and bring it in tomorrow. ... It is a problem you have that needs to be solved

Every time you observe something that “bugs you” – something that doesn’t work right, or that you think could be improved- jot it down in your notepad. You don’t need to limit this to a technological artifacts

Team Set-up







- ▣ Write on a 3x5 card the answers to the following questions that you will share with your team members:
 - What skills will you bring to the team?
 - What knowledge will you bring to the team?
- ▣ Create roles & values for your team

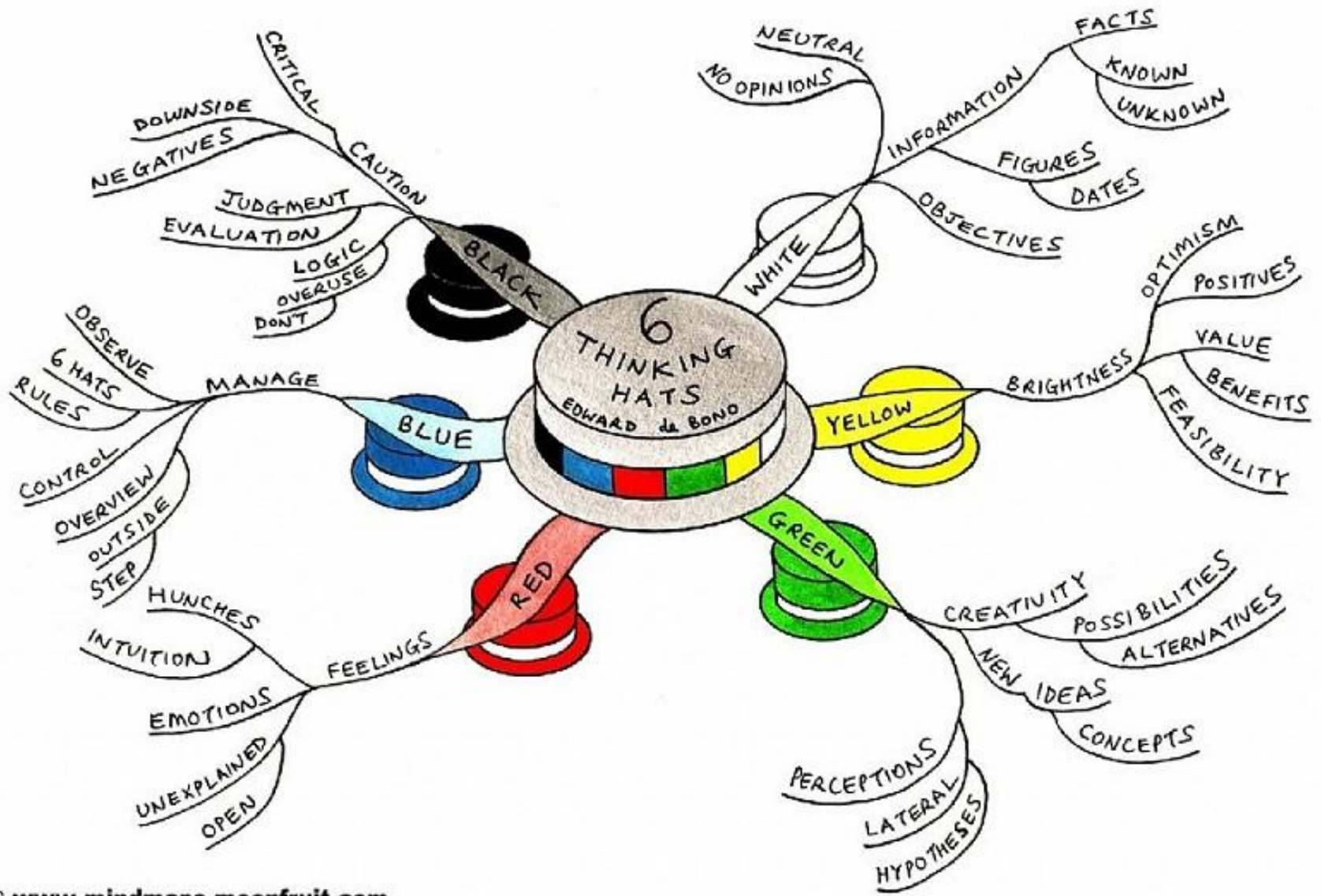
Ed deBono

Edward de Bono

- International authority on creative thinking
- Background in medicine and psychology
- Inventor of “Lateral Thinking”

In Vygotsky’s work, a mediator is something that stands as an intermediary between an environmental stimulus and an individual exposed to that stimulus. The teacher certainly can encourage these types of thinking. The concept of the 6 hats can be a resource for the teacher. .. In order to make creative thinking part of ordinary thinking, There are six metaphorical hats. The thinker can put one on or take one off to indicate the type of thinking that is being used. This putting on and taking off is essential. The hats must never be used to categorize individuals, even though their behavior may seem to invite this.

	White hat thinking identifies the facts, figures and information.
	Yellow hat thinking focuses on the positive aspects – the advantages, benefits and savings.
	Blue hat thinking focuses on reflection, metacognition (thinking about the thinking that is required), and the need to understand the big picture.
	Black hat thinking examines the problems and issues of caution.
	Green hat thinking requires creativeness, imagination and lateral thinking. It focuses on exploration, proposals and suggestions.
	Red hat thinking looks at a topic from the point of view of emotions and feelings, hunches and intuitions.



Team Activity ... dialogue

Will the charter school movement help public education?

Develop a position paper with the following categories:

1. What we know, What don't we know and what do we need.
2. How should they be connected to the public school system for learning?
3. What are the benefits and cautions
4. What our emotions tell us
5. What possibilities could come of it

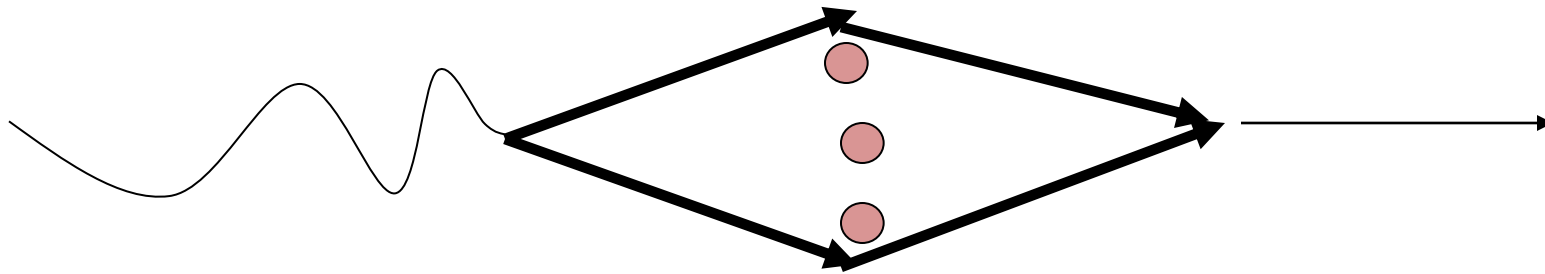
Take 25 minutes to prepare, 5 minutes to present.

Work on your BUG

Each team will select one bug to work on.

- ❑ What's the problem
- ❑ Lots of possible solutions
- ❑ Narrow down to a few
- ❑ Create Gallery sketches of the solution
- ❑ Present to the group.

Summary Process



Priming	Generative	Convergent	Defining
Story Mapping	Brain Writing	Discussion of Pro/Con	Gallery Sketches
Needs	Morphological Analysis	Shaping	Modeling/Building
Problem Framing	Shaping	Requirements	Posters
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End