CREATIVITY
And DESIGN
CREATIVE PROBLEM-SOLVING

BRAINSTORMING

GROUP PROCESS
CREATIVE PROBLEM-SOLVING

PROBLEM

DATA

the correct answer

PROBLEM

ALTERNATIVES

the most appropriate solution

CONVERGENT THINKING

DIVERGENT THINKING

DESIGN THINKING
CONVERGENT PROBLEMS
(reasonable problems)

deal more with

facts

phenomena

definitions

solving convergent problems requires

LOGICAL, REASONED ANALYSIS
CONVERGENT PROBLEMS
(reasonable problems)

Examples:

*What percentage of Engineering students are older than 25 years?*

if \( x + y = 2 \)
and \( 2x + 3y = 8 \)
then what is the value of \( y \)?
CONVERGENT SOLUTIONS

solutions are found by going through a series of

*reasoned, incremental steps*

i.e. a step-by-step process

there is usually only ONE correct answer
CONVERGENT SOLUTIONS

Example 1:

1 litre of petroleum produces 5 units of CO2 when burned in an internal combustion engine.

Therefore, at an average gas consumption of 2,000 litres per vehicle per year,

there will be

10,000 units of CO2 released/year/vehicle.
Example 2:

Solving for $x$ and $y$:

if $x + y = 2 \quad \text{(equ. 1)}$
and $2x + 3y = 8 \quad \text{(equ. 2)}$

then from (1) $x = 2 - y$
thus in (2) $4 - 2y + 3y = 8$

hence $y = 4$
and $x = -2$
DIVERGENT PROBLEMS
(unreasonable problems, wicked problems)

deal more with

insights
connections
interpretations
preferences
options

there are often MANY appropriate solutions
DIVERGENT PROBLEMS
(unreasonable problems, wicked problems)

Examples

What type of music
is the most beautiful?

How should this story
be concluded?

2 + 7 – 118 = 129
add one straight line anywhere in the equation
to make it a true statement
(there are 3 correct solutions)
DIVERGENT SOLUTIONS

Examples:

Beethoven’s Symphony No. 9

Tales of a Thousand and One Nights

Hairstyles

A painting by Jackson Pollack

Earrings

THERE IS NOT ONE ‘CORRECT’ SOLUTION
<table>
<thead>
<tr>
<th>DIVERGENT SOLUTIONS</th>
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<td>2 + 7 – 118 ≤ 129</td>
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DESIGN THINKING
Divergent + Convergent Problem Solving
DESIGN PROBLEMS

combine

CONVERGENT ELEMENTS

with

DIVERGENT ELEMENTS

in the same overall problem or project
DESIGN PROBLEMS

*How should this park, street, building or product be designed?*

- Functional Requirements (time, place, history etc.)
- Code requirements or regulations for safety, accessibility etc.
- Physical requirements (climate, environment etc.) etc.
- Budget requirements
- Cultural Norms
- Client’s Preferences
- Designer’s Preferences
DESIGN THINKING

Myths and Legends
imaginative interpretations and stories combined with physical phenomena and historical events to give meaning to the world

Religions
diverse ways of interpreting aspects of being human that include phenomena and events
e.g. creation of the world attributed to God (‘Myths are other people’s religions’ Campbell)

Science
diverse ways of interpreting phenomena,
e.g. Classical Science, Newtonian Physics, Relativity
creation of the world attributed to the ‘Big Bang’

In Cold Blood
by Truman Capote
Facts interwoven with Fiction
actual events combined with interpretations
DESIGN SOLUTIONS

there is no ONE correct answer
but each solution must have correctly solved elements

Each of the following has many design solutions
each of which adheres to similar constraints:

A CHAIR - anthropometrics, strength of materials etc.

A HOUSE - code issues, safety, standards etc

A CITY - functional requirements (retail, business, residence etc.), utilities, access etc.

A NATIONAL PARK - functional interventions balanced with natural environment

A FINAL DESIGN PROJECT PRESENTATION
client requirements, academic requirements, individual team-member requirements, in conjunction with imaginative design solutions
DEVELOPING DESIGN THINKING

Methods and Techniques

Engagement in a Process

- Design is developmental, reciprocal
- *Allow the process to unfold*
- Thoughtful Trial and Error
- Be willing to take a risk
- Becoming comfortable with *uncertainty*
- Building on experience
  - the experience of knowing uncertainty

Being creative is NOT about repeating
what has been done before
an aspect of **creative problem-solving** is

**BREAKTHROUGH THINKING**
	his is a form of creative thinking that has

a particular insight

a sudden connection

a ‘Eureka’ moment
5 STAGES OF BREAKTHROUGH THINKING
(from Archimedes’ Bathtub, David Perkins, 2000)

1. **Long Search** – wandering, seemingly aimlessly

2. **Little Apparent Progress** – before a breakthrough arrives

3. **Precipitating Event** – something external cues a breakthrough

4. **Cognitive Snap** – the breakthrough comes rapidly, a falling into place – EUREKA!

5. **Transformation** – a breakthrough can transform one’s perspective in a generative way and can alter how we see things and do things thereafter.
Things that can contribute to Creative Thinking:

**Analogy** – what is this problem like?

**Logical Extrapolation** – what is the logical outcome of developing a certain idea

**Asking the Right Question** – reframing the problem

**Systematic Large Scale Search** – considering many possibilities

**Re-purposing** – using something from one application for a new, different application (e.g. logs become rollers, rollers become wheels, wheels become water-wheels)
CREATIVE PROBLEM SOLVING
THE KLONDIKE ANALOGY

Wilderness of Possibilities – there is little gold but lots of space – the problem seems OVERWHELMING

Clueless Plateau – lack of signs that point to gold. In typical breakthrough problems there are no apparent clues that point to the solution - CLUELESSNESS

Narrow Canyon of Exploration – you keep your search within narrow boundaries – but the gold might be somewhere else entirely – but deep in this canyon you cannot see very far – you are CONFINED.

Oasis of False Promise – you find a place that is comfortable and are reluctant to leave. The oasis is not the destination but just a stop along the way – you are BEGUILED
Example of a Klondike Type Problem:

THE 9 DOTS PUZZLE
Draw 4 straight lines that pass through all 9 dots without lifting pencil from paper.
THE 9 DOTS PUZZLE

Overwhelming Wilderness - there are many possibilities, many different ways to try to solve it, different start points, different directions to draw.

Clueless Plateau - few clues, one approach is apparently as good as another.

Beguiling Oasis – the near-solutions are tempting – its easy to cover 8 dots – perhaps lingering on these near solutions will eventually lead to a complete solution.

Confining Canyon – most people confine their thinking to the box created by the 9 dots.

The solution lies outside the box.
Roving
• explore a wide range of possibilities
  (this can be casual or systematic)
• don’t linger, move on quickly
• useful technique: brainstorming

Detecting
• look harder for clues that will give direction
• the brief can provide direction, client discussions etc.
• the absence of specific constraints can yield possibilities.

Reframing
• what constraints am I taking for granted?
• how are tacit assumptions and descriptions of the situation constraining the exploration.
• re-present the problem in a new way

Decentering
• move away from the immediate solutions that don’t really work
• back-up to an earlier point, take a different path forward
• try something else
• build on what you’ve achieved in order to move on
  - but move on
BRAINSTORMING

• used to generate lots of ideas and cover a large number of possibilities QUICKLY

• can be used by individuals or by groups
THE RULES OF BRAINSTORMING

No Criticism
this is the first rule of brainstorming
during the brainstorming session criticism is out
*all* the ideas go on the list

Keep Moving
don’t hover over details
write down ideas and move on
go for quantity

Piggyback
take ideas already mentioned and extend them
add a twist

Diversify
try for different kinds of ideas
contrasting ideas
ideas from different points of view
EFFECTIVE GROUP PROCESS

The SIX THINKING HATS Technique
(Edward De Bono)

• helps control a group thinking process
• avoids trying to do everything at once
• helps direct the discussion and the generation and assessment of ideas, concepts and project direction
• alleviates disagreement by generating a parallel-thinking and a cooperative process rather than a competitive or confrontational process
• switches the thinking from ‘argument’ mode to ‘mapmaking mode’ – first make the map, then decide on the best route.
EFFECTIVE GROUP PROCESS

SIX THINKING HATS

The *Six Thinking Hats* technique:

- is simple to remember
- defines role-playing
- directs attention
- convenient way to switch-gears & eliminate negativity
SIX THINKING HATS

Each member of the team (figuratively!) wears the same coloured hat at the same time.

The *Six Thinking Hats* are:

WHITE HAT
RED HAT
BLACK HAT
YELLOW HAT
GREEN HAT
BLUE HAT
SIX THINKING HATS

WHITE HAT
• White is neutral and objective.
• The white hat is concerned with facts and figures.
• Just the facts.
• What facts, figures and information are known or needed here?

RED HAT
• Red suggests anger (seeing red), rage, emotion.
• Red hat gives the emotional view.
• What is my gut-feeling, hunch or intuition telling me about this idea or concept or direction? How do I feel about it?

BLACK HAT
• Black is gloomy, negative. Devil’s Advocate. Negative assessment.
• Black hat covers errors, risks, dangers and faults. Black hat is NOT argument.
• Why can’t this idea go ahead? What will not work?
SIX THINKING HATS

YELLOW HAT
• Yellow is sunny and optimistic. Positive assessment. NOT about new ideas
• Yellow hat is hopeful, constructive, positive thinking, opportunity seeking.
• What are the good, positive aspects of this idea?

GREEN HAT
• Green symbolises growth, fertility. Alternatives. Movement replaces judgment.
• Green hat indicates creativity, new ideas, provocation. Lateral thinking.
• What are the creative possibilities associated with this concept or direction?

BLUE HAT
• Blue is the colour of the sky – the overview. Summaries, conclusions.
• Blue hat concerned with control, discipline, organization. Orchestra conductor.
• Where is the process going, what are the overall concerns?
SIX THINKING HATS

**WHITE HAT**

**RED HAT**
Gut-feeling. Intuition. How do I feel about it?

**BLACK HAT**
Devil’s Advocate. Negative assessment. Errors. Risks

**YELLOW HAT**

**GREEN HAT**
Growth. Creativity. New ideas. Provocation

**BLUE HAT**
Overview. Summaries. Conclusions.