Creative Thinking and Problem Solving

A series of workshops for the University of the Third Age at Emerald, Victoria

Pat and Martin Buoncristiani Thinking and Learning in Concert

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Copies of the slides are available online at

ThinkingAndLearningInConcert.org

There is also other information there.

Session One
A brief review of what we know about thinking and how to improve it
Problem solving – what it is and how we do it
Memory and Remembering

Session Two
How do we talk about how we think and think about how we think?
Cognitive skills
Attention directing skills (deBono Six Thinking Hats)
Habits of Mind (Costa & Kallick)

Session Three
Lateral Thinking – escaping the dominant paradigm
Breaking the bonds of conventional thinking

Session Four
Gathering information, quality questions, thinking interdependently

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Ingredients of Productive Thinking and Learning

1. Access and deal with our experience: prior knowledge and acquired information

2. Understand how knowledge is organized in our brain

3. Think about our own thinking (metacognition)

Our Problem Solving Strategy

1) Understand the Problem
2) Devise a Plan
3) Carry out the Plan
4) Examine the solution obtained

From Georgi Polya, "How to Solve It", Princeton University Press. Original Printing 1945 (2004).

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1) Understand the problem

Clear statement:
  well posed,
  information needed,
  constraints,

Non-linguistic representation
  bubble chart, mind map, graph, matrix, ...

Write it out in a few sentences, with drawings if needed.

2) Devise a plan

Access prior knowledge

Look for connections among elements or gaps in information

For complex problems
        divide and conquer
        find a simpler problem
                relax a constraint

Decide on possible first steps

3) Carry out the plan

Check each step as you carry out your plan.

Verify that each step been completed correctly.
        Try to prove that each step is correct.
        Another way?

Monitor your progress carefully.
        Are you on track?
        Is your plan leading you to a solution?

4) Examine the solution

Verify your solution
        Does it satisfies all of the constraints?
        Is it consistent with what you already know?

Evaluate how well your plan worked in solving the given problem.

Could you use your plan to solve a similar problem in the future?

What changes would you make to make the plan more efficient?

Language to Make the Thinking Explicit

"How do I know what I think

    until I hear what I say"

We need language to clarify:

The thinking skills we use
    A list of cognitive skills

The behaviors that supporting good thinking
    Habits of Mind

The techniques we use to organize thinking
    Attention directing tools – Six Hats

In order for us to think about thinking we may also need to be able to generate non-linguistic representations.

Left–Right Brain

Left hemisphere

rational thought

controls language, mathematics, abstraction and reasoning.

Memory is stored as language.

Right hemisphere

emotional and intuitive thought

controls visual, spatial sense, social skills, holistic thought, intuition, art and music.

Memory is stored non-linguistically.

Knowledge

cat

Words + Images

Deeper understanding

Camouflage

to exploit
the natural
surroundings
to disguise
something

A Simple List of Cognitive Skills

Creating
Generating new ideas, products, or ways of viewing things
Designing, constructing, planning, producing, inventing.

Evaluating
Justifying a decision or course of action
Checking, hypothesising, critiquing, experimenting, judging

Analysing
Breaking information into parts to explore understandings and relationships
Comparing, organising, deconstructing, interrogating, finding

Applying
Using information in another familiar situation
Implementing, carrying out, using, executing

Understanding
Explaining ideas or concepts
Interpreting, summarising, paraphrasing, classifying, explaining

Remembering
Recalling information

Use Language to Engage Specific Thinking Operations

Understanding Remembering	Analyzing Applying	Creating Evaluating
Recall	Compare	Predict
Define	Contrast	Evaluate
Identify	Infer	Speculate
Describe	Analyze	Imagine
Name	Sequence	Envision
List	Synthesize	Hypothesize

Habits of Mind
Art Costa and Bena Kallick

Arthur L. Costa, Ed.D. is Emeritus Professor of Education at California State University, Sacramento and Co-founder of the Institute for Intelligent Behavior in El Dorado Hills, California.

Bena Kallick is an international education consultant and co-founder and co-director of Technology Pathways Corporation.

Habits of Mind 1
Personal Traits

Persisting
Managing impulsivity
Striving for accuracy
Finding humor

Acquiring Information

Gathering data through all senses
Listening with understanding and empathy
Questioning and posing problems
Remaining open to continuous learning

Habits of Mind 2
Thinking Tools

Thinking flexibly
Thinking and communicating with clarity and precision
Thinking interdependently
Applying past knowledge to new situations

Personal Responses to Thought

Creating, imagining, innovating
Responding with wonderment and awe
Thinking about thinking (metacognition)
Taking responsible risks

Edward deBono

Edward de Bono was born in Malta.

M.D. from University of Malta

Rhodes Scholar at Oxford

Ph. D. from Oxford

He has held appointments at the universities of Oxford, London, Cambridge and Harvard.

His work has focused on techniques for effective thinking. He introduced the term "Lateral Thinking" and we will use his "Six Hat" and "Attention Directing Tools".

Flexible Thinking Tools

Make thinking explicit
(from Edward deBono)

PMI – Plus, Minus, and Interesting
CAF – Consider All Factors
APC – Alternatives, Possibilities or Choices
C & S – Consequences and Sequel

FIP – Focus on Priorities
AGO – Aims, Goals and Objectives
OPV – Other People's Views

My mechanic says my 1990 Subaru needs a new timing chain. Should I replace the car?

PMI – Plus, Minus, and Interesting

APC – Alternatives, Possibilities or Choices

C & S – Consequences and Sequel

DeBono's Thinking Hats

Focus on data available
Facts and figures
Neutral and objective

Focus on intuition and emotion
How will other people react
Examine the human element

Think negatively
Identify weakness, flaws
Focus is pessimism

Think positively
Find benefits and values
Focus is optimistic

Focus on new ideas
Many ideas uncritical
Creativity

Worn by chairs
Focus on process control
Leadership

processing

Assertion

On days of Total Fire Ban my family and I will stay and defend our home.

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processing

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Problem Solving with the Subconscious?

Can you recall an situation where the solution to a problem came to you unexpectedly?

Much of our waking hours are spent with our minds cluttered with things needed to get on with our life.

If we take some time to focus attention on a specific problem and frame it carefully it will be lodged in our mind and our subconscious can work on it.

Later, at a time when our mind is not too cluttered with the business of daily life, our subconscious will present an idea for the solution.
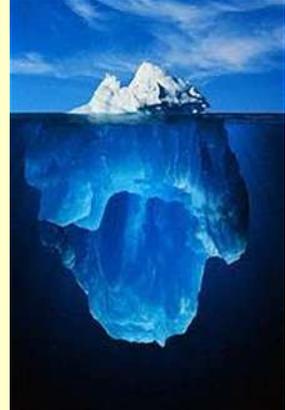
Conscious Mind

Sub-conscious Mind

A recipe for subconscious problem solving.

Think carefully about your problem and describe it in writing in just a few sentences.

Just before you get into bed read the description