Brain, Creative Problem Solving & Analytical, and Critical Skills

By
Pr. Moustafa M. Achoui
amusta2009@gmail.com

The short course objectives

1. Understanding the brain main structure.
2. Understanding the brain main functions:

A. Left brain functions: upper and lower sides.

B. Right brain functions: upper and lower sides.

3. Be familiar with "The Four-Quadrant Brain Model of Thinking Preferences".

Continue

4. To be familiar with the Whole Brain Concept.
5. To be able to implement the whole brain concept in innovation and creativity.
6. To be able to practice problem solving techniques.
7. To be able to detect barriers to creativity.

Introduction

- The importance of skills of future employment.
- The World is competing for Human Resources and natural resources.
- Human resources are more important.

International reports about the importance of soft skills

- Foundation for Young Australians (2016). -- Big data analysis reveals the skills young people need for the New Work Order.

http://www.fya.org.au/wp-content/uploads/2016/04/The-New-Basics_Web_Final.pdf

- The "Enterprise Skills" for future work are:

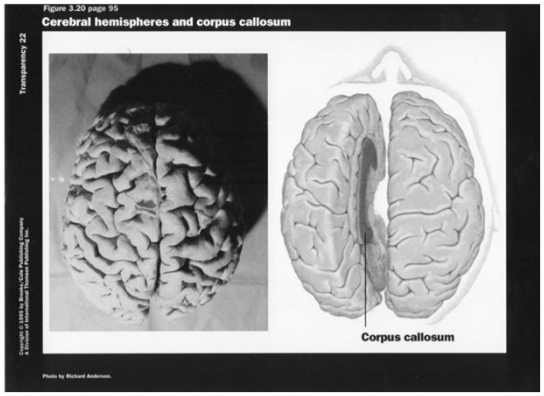
Problem Solving skills, Communication skills, Digital skills, Team Work skills, Critical Thinking skills, Creativity skills and Finance skills.

Continued

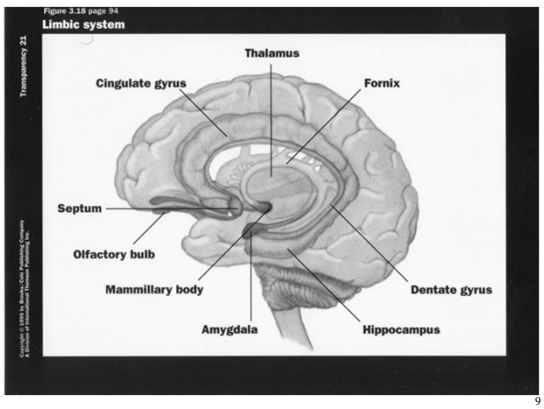
- The World Economic Forum Report in 2016:
- The Future Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution.
- Changing the educational systems.

Brain Structure & Functions

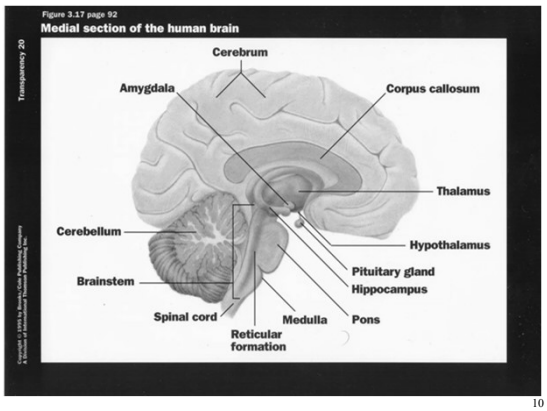
- Relationship between the brain & skills.
- Learning is neuron connections.
- What is the structure of the human brain?
- What are the functions of the human brain?



8



9



10

Neurons

- The brain is consisted of more than 100 billions neurons !
- How much we use?
- Don't forget the heart !!

The Four-Quadrant Brain Model of Thinking

- Brain as a structure, and functions.

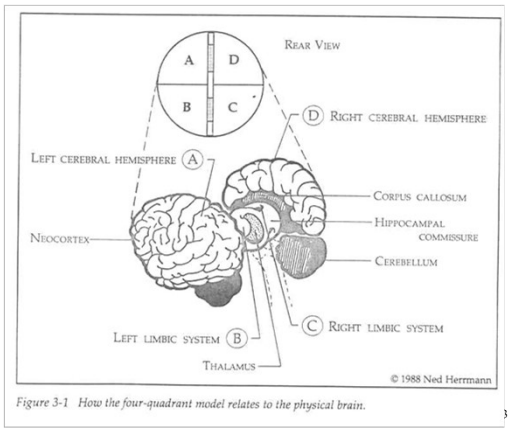
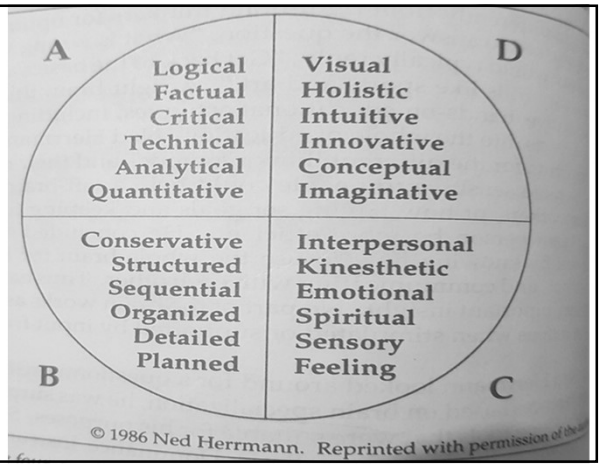


Figure 3-1 How the four-quadrant model relates to the physical brain.



The Four-Quadrant Brain Model of Thinking Preferences

- **Dr. Sperry won the Noble prize on 1981 on the functions of the brain.**

- Neuro-psychology has found that for most people:

1- Mathematical and verbal thinking are in the left hemisphere.

2- Spatial, holistic and imaginative thinking is in the right hemisphere.

- **In 1986, Herman *observed that the brain is a specialized organ.***

The Concept of Brain Dominance

- The two halves of the brain are not used by People in the same way and with the same frequency.
- People develop dominance: Left brain dominance / right brain dominance.
- People use their dominant mode when they need to solve a problem or learn something new.

1- *Left Brain approach depends on:* Solving a problem analytically by looking at facts & numbers and putting everything into a logical formula or sequential procedure.

2- *Right Brain approach depends on*: Searching patterns and images involving sensory impressions in order to get an intuitive understanding of the whole problem.

Brain Dominance & Performance Effectiveness

- For more effectiveness in education both abilities should be encouraged and balanced.

- Faculty and students, for example, should be trained how to use and integrate these abilities for **"Whole- Brain"** thinking, and creative problem solving.

** Discussion: Does our educational system encourage the left or the right brain approach?*

Brain Dominance & Performance Effectiveness

- Note that the brain is divided to the right and left hemispheres.

- These two structures contain 80% of the brain.

- The primary mental processes in these hemispheres include:
Vision, hearing, body sensation, intentional motor control, reasoning, conscious thinking and decision making, language and nonverbal visualization, imagination and idea synthesis.

How the "Four-Quadrant Model" relates to the physical brain?

- Herrmann noted that:
Thinking preferences seemed to fall into 4 clusters, not 2 clusters.

- In assessing over half a million people, Hermann has found that:
**** 7% have a single dominance.***

**** 60% have a double dominance.***

**** 30% have a triple dominance.***

**** 3% have a quadruple dominance.***

The Quadrant A thinking

1- Characteristics:
Factual, analytical, logical, critical.

2- Preferred subjects:
Arithmetic, algebra, calculus, sciences & technology.

3- Careers:
Engineers, computer scientists, bankers.

4- Culture:
Achievement oriented, performance driven.

Exercises to develop quadrant A thinking

- Collect data and information about a particular subject or problem.
- Organize the collected information logically into categories.
- Develop graphs, flowcharts, and outlines from data and information.
- Take a broken small appliance apart: find out about the function of each part.
- Play chess, do logic puzzles or games.

Continue

- Learn how to use an analytical software package or program on your computer.
- Play “devil’s advocate” in a decision process.

The Quadrant B thinking

1- Characteristics:
Organized, structured, sequential, planned, Detailed.

2- Subjects preferred:
Law, management.

3- Careers:
Bureaucrats, administrators, planners, bookkeepers.

4- Culture:
Traditional, production oriented, bureaucratic, reliable.

Exercises to develop quadrant B thinking

- Learn a new habit through planning and self-discipline.
- Plan a project by writing down each step in detail; then do it.
- Assemble a model kit by instruction.
- Develop a personal budget, then keep it for two weeks.

Continue

- Set up a filing system for your activities,
- Organize your desk or clothes closet.
- Be exactly on time all day.
- Learn time management skills.

The Quadrant C thinking

1- Characteristics:
Sensory, emotional, people-oriented.

2- Subjects preferred:
Social Sciences, music, drama.

3- Careers:
Teachers, nurses, social workers.

4- Culture:
Humanistic, cooperative, spiritual, value-oriented, feeling-oriented.

Exercises to develop quadrant C thinking

- Get together with a friend; share your feelings about a topic or issue.
- In conversation, spend most of the time listening to the other person.
- Play with a small child the way he or she wants to play.
- Think about what other people (parents) have done for you and find a way to thank them.

Continue

- Become a volunteer in an activity.
- Explore your spirituality. Read about faith and religion.
- Practice artistic activities.
- Enjoy a walk in nature.
- Create a mood in your room.
- Make time for family meals and celebrations.
- Play a musical instrument or listen to music.

The Quadrant D thinking

1- Characteristics:
Visual, holistic, innovative, creative.

2- Subjects preferred:
Arts, geometry, design, poetry & architecture.

3- Careers:
Artists, entrepreneur, researchers.

4- Culture:
Explorative, inventive, entrepreneurial, future-oriented.

Exercises to develop quadrant D thinking

- Look at the big picture, not the details, of a problem or issue.
- Make a study of a trend, and prepare at least three scenarios.
- Ask what-if questions, and come up with many different answers.
- Allow yourself to daydream.
- Make sketches to help you memorize material that you are learning.

Continue

- When solving problems, find two or three different ways to do them.
- Create a logo for your school, for example.
- Do Problems that require brain storming; find at least ten possible answers.
- Learn to paint, draw and sketch.
- Design a plane, for example, and fly it.
- Take as many as photos of a seen, try unusual shots.
- Imagine yourself in 2030/2050/2070.

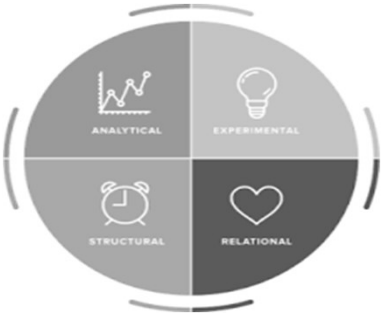
HBID in Companies

The world's largest organizations trust Herrmann. Will you?

More than 2 million people from 97% of Fortune 100 companies have used Whole

Brain® Thinking to improve productivity, innovation, collaboration, and inclusion.

Simple Model



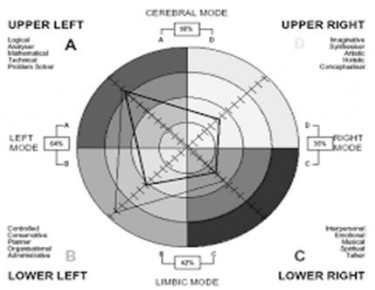
Herrmann Brain Dominance Instrument (HBDI)

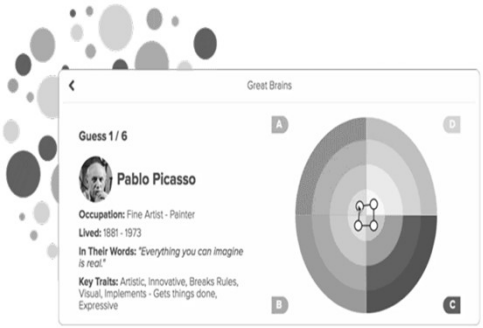
- A **system to measure and describe thinking preferences in people**, developed by William "Ned" Herrmann while leading management education at General Electric's Crotonville facility.

Continue

- The HBDI® Test is a powerful psychometric assessment that defines and describes the degree to which we **Think** in the four quadrants of the Whole Brain® Model.
- HBDI Tests indicate the way we **Think** as by understanding how you and your team members think means you can make decisions, solve problems, communicate work with and manage others far more effectively.

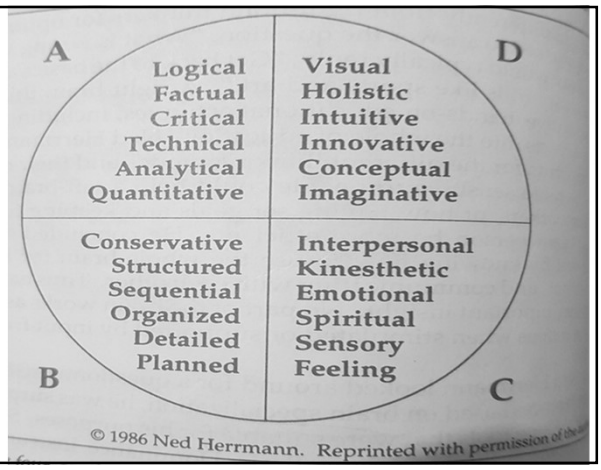
Example





Exercise

- What is your mindset?
- Check it !!



Critical Thinking
and
Creativity

1- Creativity is mainly in quadrant D.

2- Critical Thinking is mainly in quadrant A.

3- Both Critical Thinking and Creativity should be developed.

4- The Goal of training is the whole brain development = A + B + C + D

Exercise

- What is your thinking preferences?
- Relate your answer to the four quadrant thinking model.
- Do you have any suggestion to improve the model?

The whole Brain Concept

- To develop the whole brain thinking in order to be:
  - ❖ More critical,
  - ❖ More creative,
  - ❖ More sympathetic: emotional intelligence.

Organizational Implications

1- It was found that people are more effective when their activities match their thinking preferences.

-Brain preference is not equal competence.

2- Competency is achieved through: Motivating, Training & Practicing.

3- Many organizations/Universities tend to be entrenched in quadrant B thinking: Bureaucratic & conservative systems ?!

Discussion
What do you think about our universities?

How to develop creative problem solving?

- **What is a Problem?**
- **How do you solve a problem?**
- **Looking to the problem from different angles.**
- **Incubation**

Continue

- **A problem is not only something that is not working right or well.**
- **A problem is anything that could be made different or better through some change or development.**
- **A problem has two aspects:**
- **a) It can involve a difficulty or (danger).**
- **b) It can represent an opportunity or a (challenge) even when there is a danger (when it is over).**

continue

- **Creative thinking is not taught in our schools and universities.**
- **Mathematics courses for example, provide some training in analytical thinking.**
- **It is estimated that 80% of problems in life need to be approached, and solved with creative thinking.**
- **Most students are not trained in developing critical thinking & creative problem solving .**

What is creative problem solving?

- **- Creative problem solving involve three types of thinking:**
- **a) Analytical thinking.**
- **b) Critical thinking.**
- **C) Creative thinking.**

What is Creative Thinking?

- **CT is playing with imagination and different possibilities, then making new and meaningful connections while interacting with ideas, people, and environment (physical and social environments).**

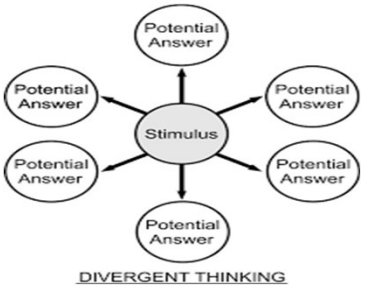
Steps of Creative Problem Solving

- **CPS has five steps that correspond with different, distinct mindsets or thinking modes.**
- **CPS is a sequence of successive phases of divergent thinking, followed by convergent thinking.**
- **Use the whole brain concept.**

Divergent Thinking

- Divergent thinking is a thought process or method used to generate creative ideas by exploring many possible solutions.
- It typically occurs in a spontaneous, free-flowing, "non-linear" manner, such that many ideas are generated in an emergent cognitive fashion.

What is divergent thinking?



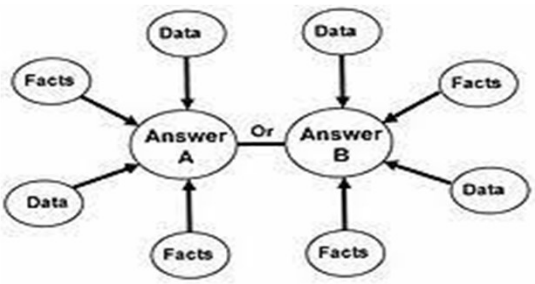
Examples

- 1 + 1= ?
- 4 + 4 = ?

What is convergent thinking?

- Convergent thinking occurs when the solution to a problem can be deduced by applying established rules and logical reasoning.
- This type of reasoning involves solving a problem within the context of known information and narrowing down the solution based on logical inference.

Convergent Thinking



- Divergent and Convergent thinking are used in steps with different mindsets:

a) **The explorer and detective for problem definition;**

b) **The artist for idea generation;**

c) **The engineer for creative idea evaluation, and synthesis;**

d) **The judge for idea judgement and decision making;**

e) **The producer for putting the best solutions into action.**

Video

- https://www.youtube.com/watch?v=xjE2RV6IQzo

Continue

- Analytical thinking involves the process of gathering relevant information and identifying key issues related to this information.
- This type of thinking also requires you to compare sets of data from different sources; identify possible cause and effect patterns, and draw appropriate conclusions from these datasets in order to arrive at appropriate solutions.

Analytical Thinking Skills

- What is Critical Thinking?

- Critical thinking refers to evaluating information, and then making a decision based on your findings.
- Critical thinking is what helps an employees/students make decisions that help solve problems for a company.

Critical Thinking Skills

- 1- Analytical skill
- 2- Induction skill
- 3- Deduction skill
- 4- Inference skill
- 5- Evaluation skill

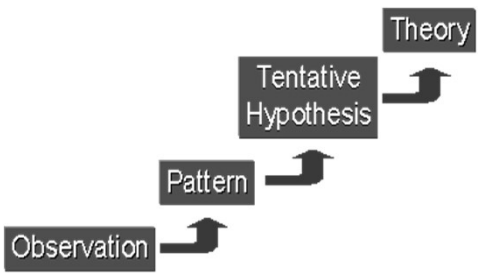
Analytical Skill

- **Ability to collect and analyze information, problem-solve, and make decisions**.
- You use analytical skills when detecting patterns, brainstorming, observing, interpreting data, and making decisions based on the multiple factors and options available to you.

Inductive Reasoning Skill

- Beginning with specific observations and measures,
- Detect patterns and regularities,
- Formulate some tentative hypotheses that we can explore,
- Finally end up developing some general conclusions or theories.

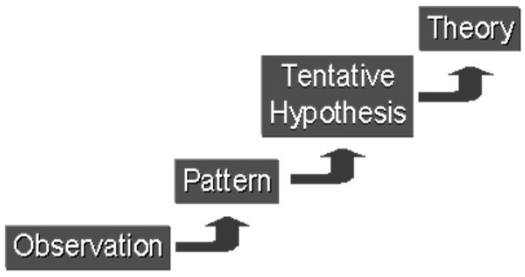
Inductive Reasoning Skill



Deductive Reasoning Skill

- It starts from the more general to the more specific.
- We might begin with thinking up a *theory* about our topic of interest.
- We then narrow that down into more specific *hypotheses* that we can test.
- We narrow down even further when we collect *observations* to address the hypotheses.
- This ultimately leads us to be able to test the hypotheses with specific data – a *confirmation* (or not) of our original theories.

Deductive Reasoning Skill



Inference Skill

- We use reason to form inferences: conclusions drawn from propositions or assumptions that are supposed to be true.

Evaluation Skill

- To evaluate, or 'critically' evaluate is to reach a conclusion, through a process of critical thinking, about the value, or 'soundness' of an argument.
- Critical analysis is a key activity in evaluation.
- Evaluation is about weighing up the strengths and weaknesses of an argument in order to decide its value.

Brain Storming Rules

- State the problem.
- Generate as many solutions as possible.
- Wild/strange ideas are encouraged.
- No criticism is allowed.
- Judgement is deferred until later.
- Chose the best answer/answers.

Brain Storming Methods

- Verbal Brain Storming: The artist Mindset.
- Written Brain Storming
- Delphi technique

Brain Storming

- Exercise:
- In small groups formulate a real problem, and try to find as much as solutions to it.

Overcoming Mental Barriers to Creative Thinking

71

Mental Blocks

❖ **False assumptions:**

a) "An intelligent mind is a good thinker".

b) "Play is frivolous" (No serious value).

☹ **c) "Creativity cannot be taught or**
☹ **learned".**

\- **d) Humor: Humor reduces tension, stress and monotony.**

72

How to Cure False Assumptions?

- **Get facts.**

  Use quadrant A thinking: Critical & Analytical.

  Learn to play with ideas.

- **Practice quadrant D thinking.**
  - What-if by playing with possibilities.
  - What if by using computer.
- **Implement creativity and Whole-Brain thinking into your life.**

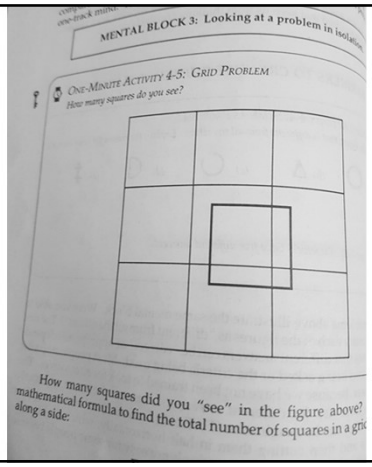
Mental Blocks to Creative Thinking

- ***Habits: Example***

- ***Mental block 1***: **There is only one right answer to a question.**
- **Example: 4 + 4 = ?**
- ***Mental block 2:*** **Looking at a problem in isolation.**

Exercise

- **How many squares?**
- **Design the following square and calculate.**


MENTAL BLOCK 3: Looking at a problem in isolation

ONE-MINUTE ACTIVITY 4-5: GRID PROBLEM
How many squares do you see?

How many squares did you "see" in the figure above?
mathematical formula to find the total number of squares in a gri
along a side:

Attitudes and Emotions

- ✓ **Attitudes and emotions can be serious barriers to creative thinking because they are difficult to deal with and to change.**
- ✓ **Negative emotions may hinder creativity.**
- ✓ **Solution: Improvements in our quadrant C thinking are required.**

Other Blocks

- **Mental block 1: *"Negative thinking".***
- Mental block 2: *"Risk avoidance or fear of failure".*
- **Mental block 3: *"Discomfort with ambiguity".***

Other blocks

- Stress
- Cultural barriers

Conclusion

- Practice Creativity & Creative Problem Solving in your life….

Any question or feedback?

References

- Lumsdaine, E.; Lumsdaine, M. (1995). Creative Problem Solving. McGraw-Hill International Editions. New York.
- Several websites.